Supporting Information

Local Exposure to School Shootings and Youth Antidepressant Use

Rossin-Slater, Schnell, Schwandt, Trejo, and Uniat (2020)

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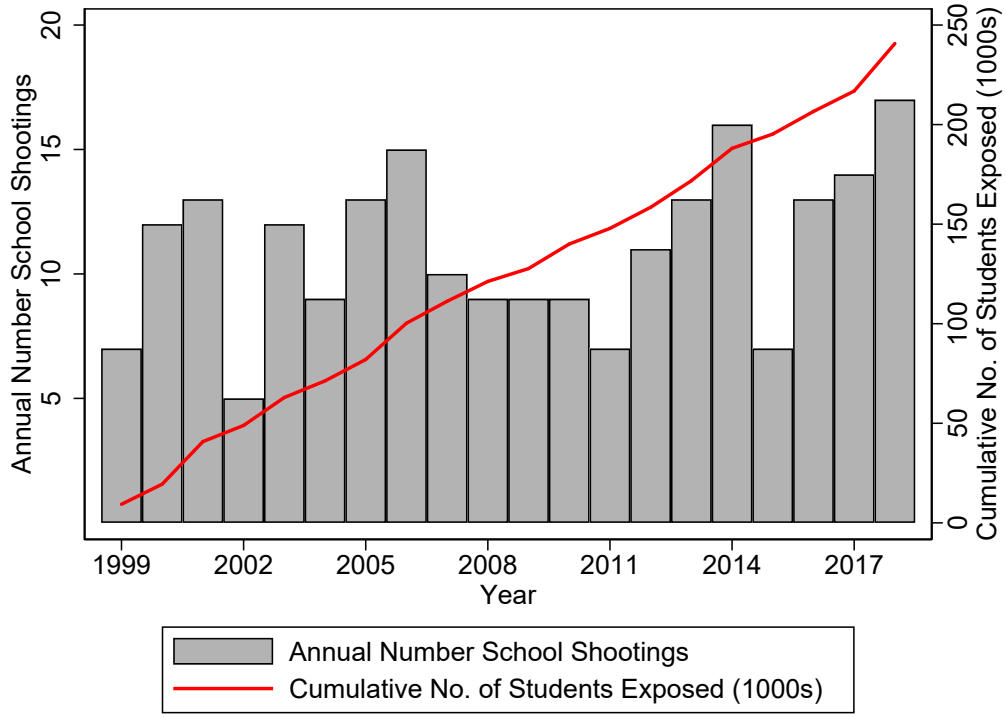
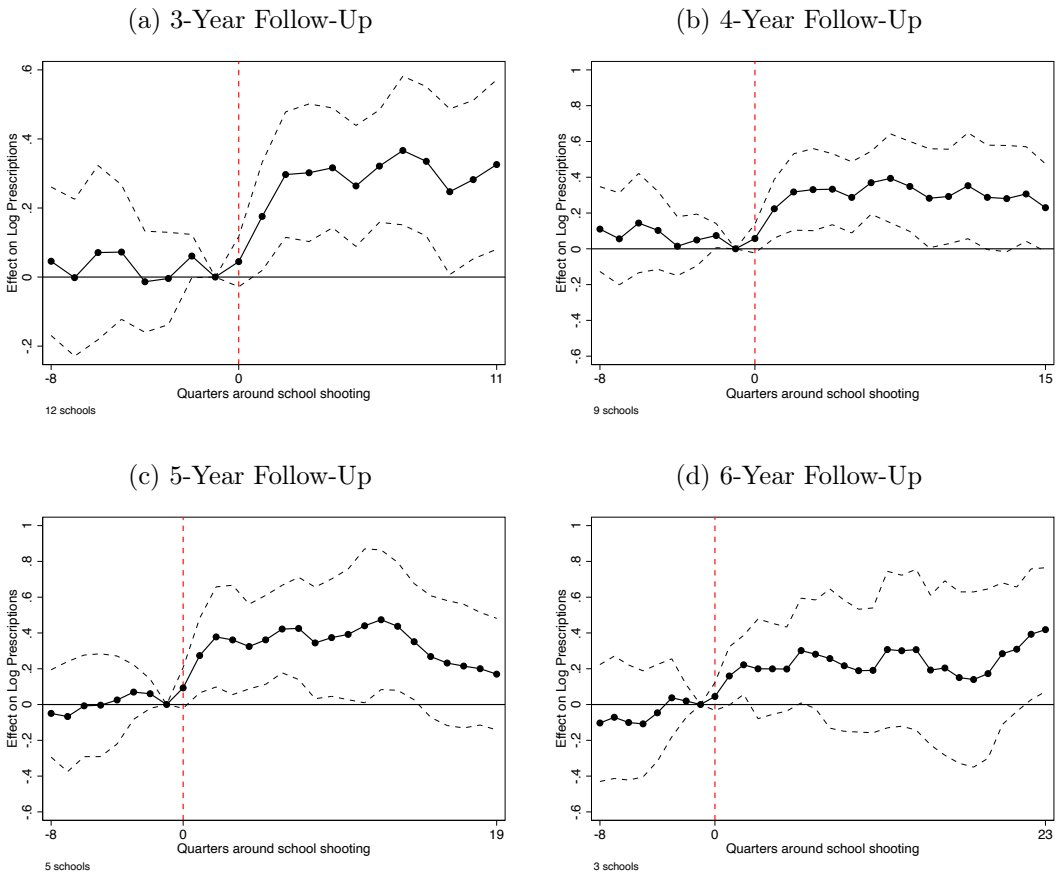
A Supplementary Figures

Figure S1: Shootings at U.S. Primary and Secondary Schools: April 1999–May 2018



Notes: The bars depict the number of school shootings at primary and secondary schools in the United States in each calendar year over the period April 1999–May 2018; the line depicts the cumulative number of students who were enrolled in schools that experienced shootings over the same time period. Our main analysis uses data on school shootings between January 2008 and April 2013. Source: *Washington Post* database on school shootings, downloaded on June 20, 2018.

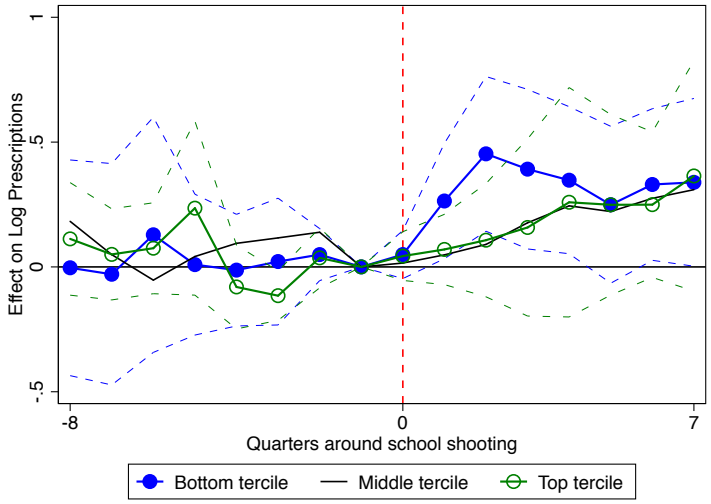
Figure S2: Effects of Fatal School Shootings on Youth Antidepressant Use: 3–6 Year Follow-Up Windows



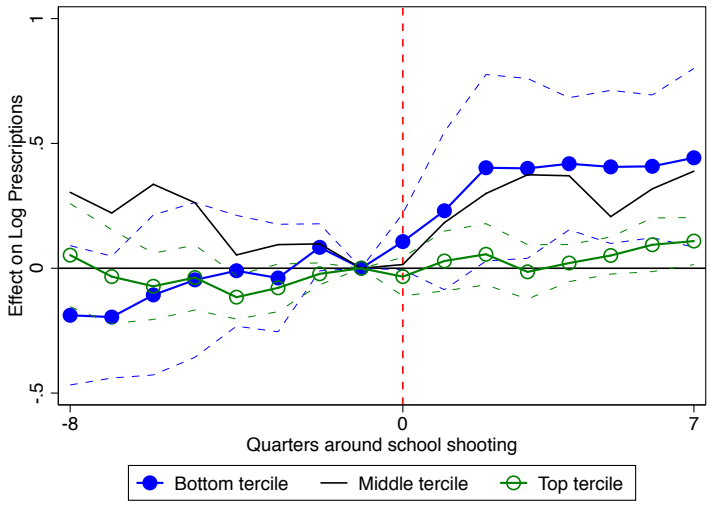
Notes: The above figures present output from estimation of our event study specification using alternative follow-up windows. The number of schools used in the estimation is denoted under each graph. We regress log antidepressant prescriptions for individuals under age 20 at the school–area–month level on quarterly event time indicators, quarterly event time indicators interacted with an indicator denoting treatment areas, month-by-year fixed effects, and school-by-area fixed effects. We plot the coefficients and 95% confidence intervals on the interactions between quarterly event time indicators and the indicator denoting treatment areas; these coefficients represent the percentage difference in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas in each of the quarters surrounding a school shooting relative to the quarter before the shooting. The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions only consider fatal school shootings and are weighted by school enrollment. Standard errors are clustered at the school-by-area level.

Figure S3: Effects of Fatal School Shootings on Youth Antidepressant Use by Density of Mental Health Care Providers

(a) Density of Prescribers

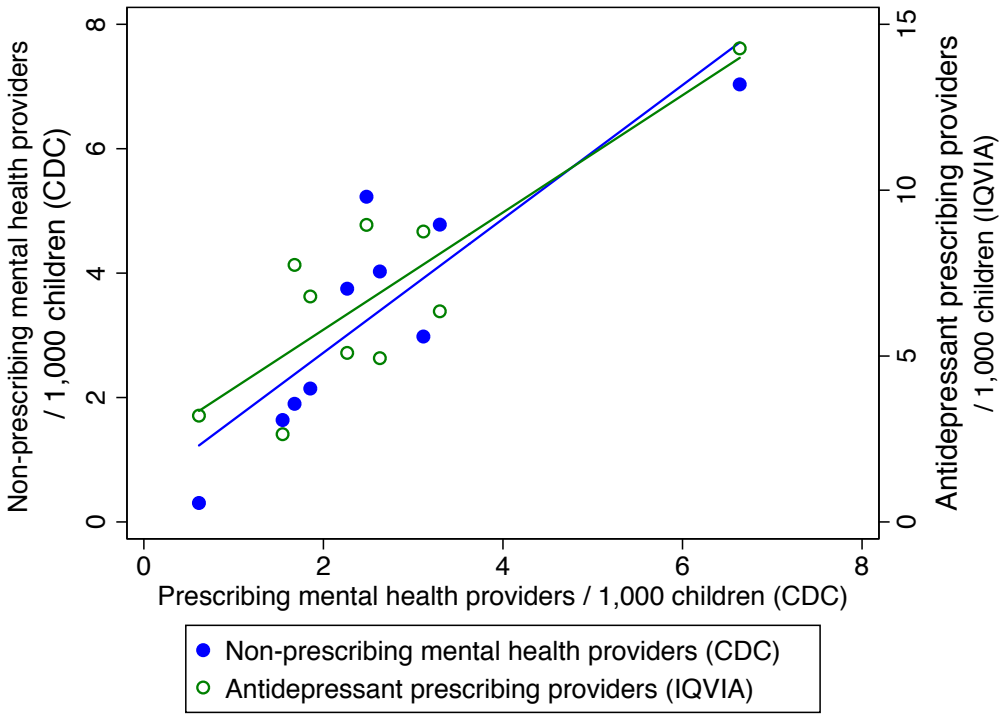


(b) Density of Non-Prescribers



Notes: The above figures present output from estimation of augmented versions of our event study specification. We regress log antidepressant prescriptions for individuals under age 20 at the school–area–month level on quarterly event time indicators; quarterly event time indicators interacted with an indicator denoting treatment areas; interactions between quarterly event time indicators, the treatment indicator, and terciles of county-level measures of the density of child mental health providers; month-by-year fixed effects; and school-by-area fixed effects. We include the density measures separately for "Prescribers" (physicians in family medicine, pediatrics, and psychiatry per 1,000 children aged 0–17; subfigure (a)) and "Non-Prescribers" (psychologists and social workers per 1,000 children aged 0–17; subfigure (b)). We plot the coefficients and 95% confidence intervals on the interactions between quarterly event time indicators, the indicator denoting treatment areas, and terciles of county-level measures of child mental health provider densities; these coefficients represent the percentage difference in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas in each of the quarters surrounding a school shooting relative to the quarter before the shooting. The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions only consider fatal school shootings and are weighted by school enrollment. Standard errors are clustered at the school-by-area level.

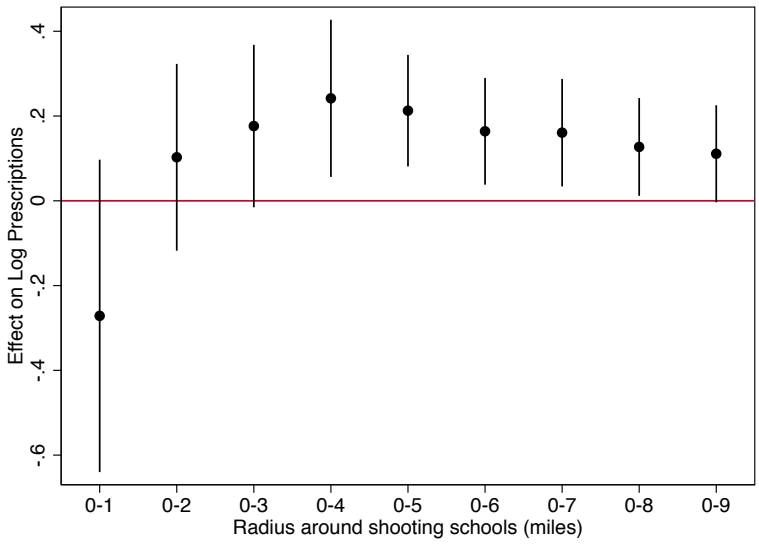
Figure S4: Correlation Between Provider Density Measures



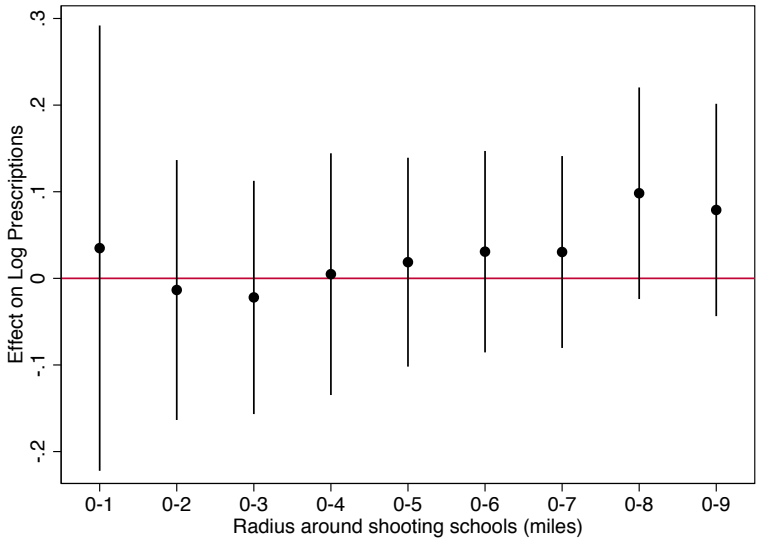
Notes: The above figure depicts the correlation between different measures of local provider density. The x-axis measures the county-level number of child mental health care providers who can prescribe medication (physicians in family medicine, pediatrics, and psychiatry) per 1,000 children aged 0–17 as reported by the CDC. The left y-axis measures the county-level number of child mental health care providers who traditionally cannot prescribe medication (psychologists and social workers) per 1,000 children aged 0–17 as reported by the CDC. The right $y-$axis measures the number of providers in the IQVIA data who prescribed at least one antidepressant to an individual under age 20 in 2010 in each school's treatment area per 1,000 individuals under age 20 living in these areas. The points represent deciles of schools in our main analysis grouped according to densities of prescribers from the CDC; the lines are linear fits of these points.

Figure S5: Sensitivity of Estimates to Varying the Radius Defining Treatment Areas

(a) Fatal Shootings



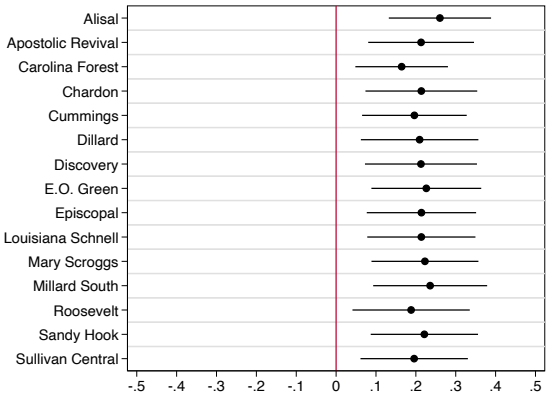
(b) Non-Fatal Shootings



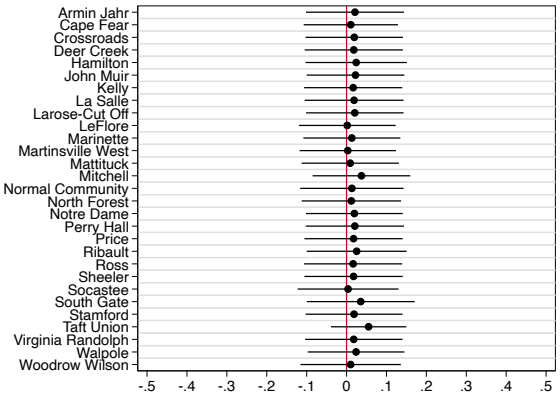
Notes: Each subfigure presents output from estimation of nine separate versions of our difference-in-difference specification in which we vary the definition of treatment areas to include providers located between 0–1 to 0–9 miles of an affected school. We hold the reference areas fixed at providers practicing 10–15 miles from an affected school in all specifications. We run these nine sets of regressions separately for fatal (subfigure (a)) and non-fatal (subfigure (b)) school shootings. We plot the coefficients and 95% confidence intervals on the interaction between the post indicator and the indicator denoting treatment areas; these coefficients represent the percentage difference in the post-shooting change in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas.

Figure S6: Sensitivity of Estimates to Excluding Each School

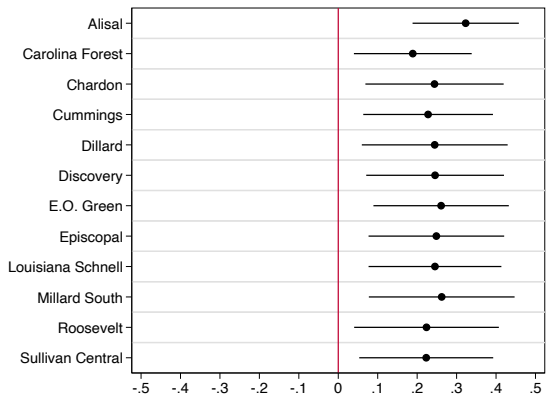
(a) Fatal Shootings, 2-Year Follow-Up



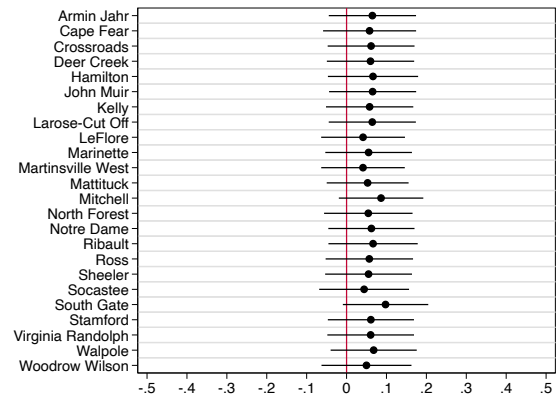
(b) Non-Fatal Shootings, 2-Year Follow-Up



(c) Fatal Shootings, 3-Year Follow-Up



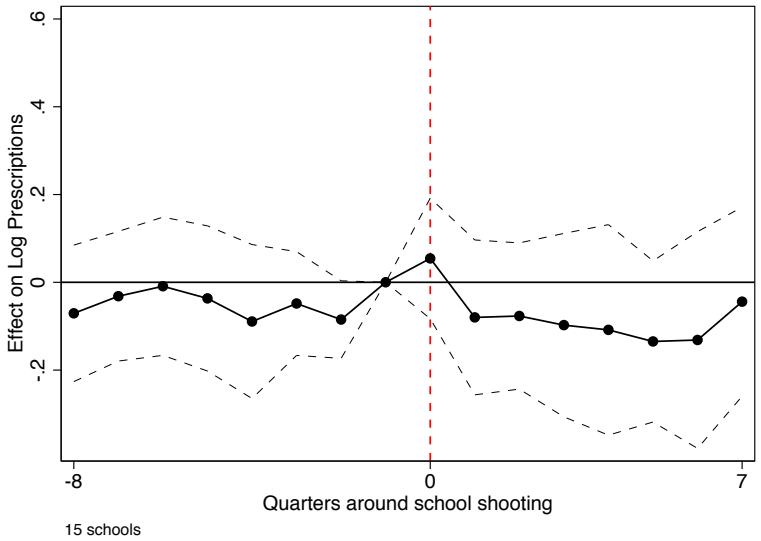
(d) Non-Fatal Shootings, 3-Year Follow-Up



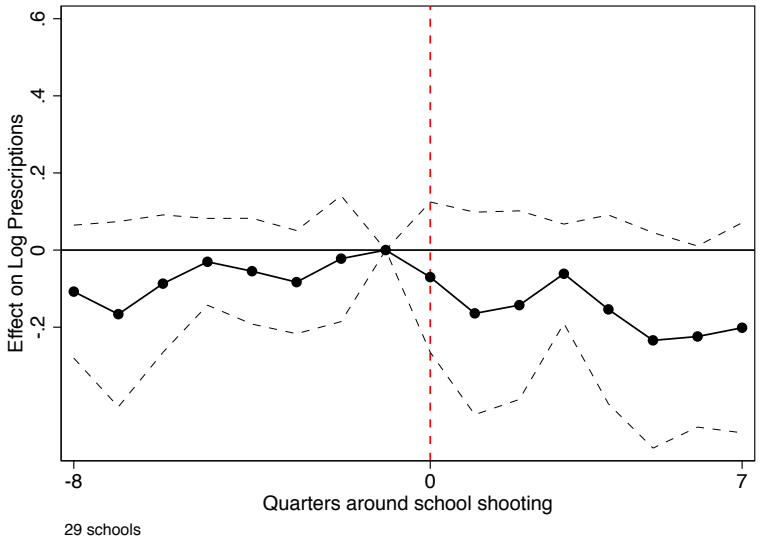
Notes: Each subfigure presents output from estimation of separate versions of our difference-in-difference specification excluding one school at a time. The excluded school is denoting on the y-axis. We run these sets of regressions separately for fatal (subfigures (a) and (c)) and non-fatal (subfigures (b) and (d)) school shootings, using two-year (subfigures (a) and (b)) or three-year (subfigures (c) and (d)) follow-up windows. We plot the coefficients and 95% confidence intervals on the interaction between the post indicator and the indicator denoting treatment areas; these coefficients represent the percentage difference in the post-shooting change in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas.

Figure S7: Effects of School Shootings on Youth Opioid Use (Placebo)

(a) Fatal Shootings



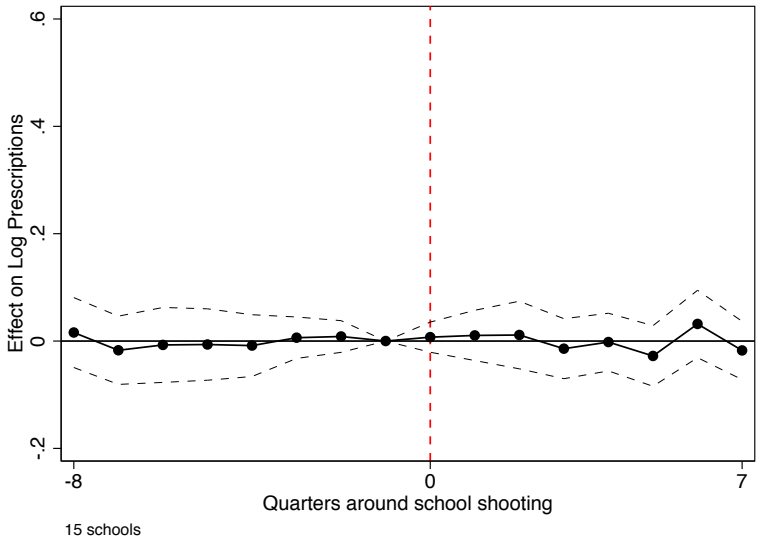
(b) Non-Fatal Shootings



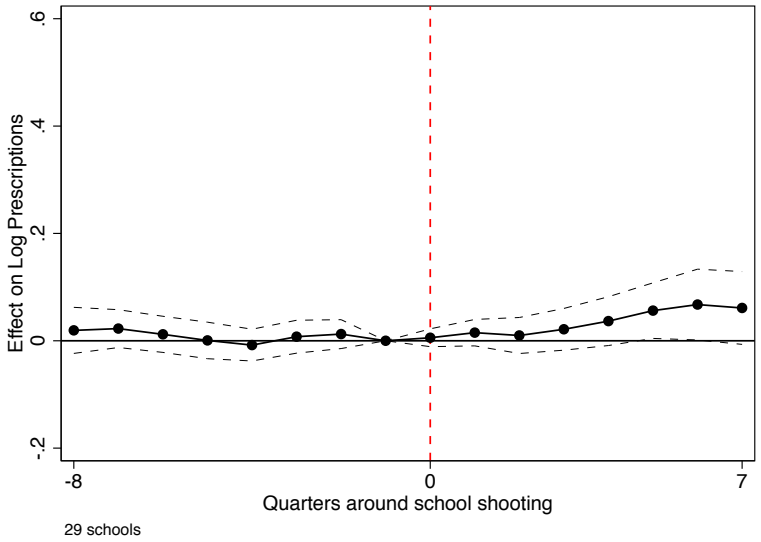
Notes: The above figures present output from estimation of our event study specification using opioid prescriptions as the outcome. We regress log opioid prescriptions for individuals under age 20 at the school–area–month level on quarterly event time indicators, quarterly event time indicators interacted with an indicator denoting treatment areas, month-by-year fixed effects, and school-by-area fixed effects. We run separate regressions for fatal (subfigure (a)) and non-fatal (subfigure (b)) school shootings. We plot the coefficients and 95% confidence intervals on the interactions between quarterly event time indicators and the indicator denoting treatment areas; these coefficients represent the percentage difference in the number of opioid prescriptions written to individuals under age 20 between the treatment and reference areas in each of the quarters surrounding a school shooting relative to the quarter before the shooting. The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions are weighted by school enrollment, and standard errors are clustered at the school-by-area level.

Figure S8: Effects of School Shootings on Adult Antidepressant Use

(a) Fatal Shootings



(b) Non-Fatal Shootings



Notes: The above figures present output from estimation of our event study specification using adult antidepressant use as the outcome. We regress log antidepressant prescriptions for individuals aged 20 and older at the school–area–month level on quarterly event time indicators, quarterly event time indicators interacted with an indicator denoting treatment areas, month-by-year fixed effects, and school-by-area fixed effects. We run separate regressions for fatal (subfigure (a)) and non-fatal (subfigure (b)) school shootings. We plot the coefficients and 95% confidence intervals on the interactions between quarterly event time indicators and the indicator denoting treatment areas; these coefficients represent the percentage difference in the number of antidepressant prescriptions written to individuals aged 20 and older between the treatment and reference areas in each of the quarters surrounding a school shooting relative to the quarter before the shooting. The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions are weighted by school enrollment, and standard errors are clustered at the school-by-area level.

B Supplementary Tables

Table S1: School Shootings in Main Analysis Sample

School	Date	#Killed	#Injured	Shooter Died?
Alisal High School	Oct 2010	1	0	No
Apostolic Revival Center and Christian School	Jan 2013	1	0	No
Armin Jahr Elementary School	Feb 2012	0	1	No
Cape Fear High School	Oct 2011	0	1	No
Carolina Forest High School	Oct 2009	1	0	No
Chardon High School	Feb 2012	3	3	No
Crossroads Charter High School	Jan 2008	0	1	No
Cummings Middle School	Jan 2012	1	0	No
Deer Creek Middle School	Feb 2010	0	2	No
Dillard High School	Nov 2008	1	0	No
Discovery Middle School	Feb 2010	1	0	No
E.O. Green Junior High School	Feb 2008	1	0	No
Episcopal School of Jacksonville	Mar 2012	1	0	Yes
Hamilton High School	Feb 2008	0	1	No
John Muir Elementary School	Feb 2009	0	0	No
Kelly Elementary School	Oct 2010	0	2	No
La Salle High School	Apr 2013	0	0	No
Larose-Cut Off Middle School	May 2009	0	0	Yes
LeFlore High School	Mar 2012	0	0	No
Louisiana Schnell Elementary School	Feb 2011	1	0	No
Marinette High School	Nov 2010	0	0	Yes
Martinsville West Middle	Mar 2011	0	1	No
Mary Scroggs Elementary School	May 2012	1	0	No
Mattituck Junior-Senior High School	Oct 2009	0	1	No
Millard South High School	Jan 2011	1	2	Yes
Mitchell High School	Feb 2008	0	1	No
Normal Community High School	Sep 2012	0	0	No
North Forest High School	Jan 2012	0	1	No
Notre Dame Elementary School	Feb 2008	0	1	Yes
Perry Hall High School	Aug 2012	0	1	No
Price Middle School	Jan 2013	0	1	No
Ribault High School	Mar 2009	0	0	No
Roosevelt High School	Apr 2008	1	0	No
Ross Elementary School	Apr 2011	0	2	No
Sandy Hook Elementary School	Dec 2012	26	2	Yes
Sheeler Charter High School	Apr 2011	0	1	No
Socastee High School	Sep 2010	0	1	No
South Gate High School	May 2010	0	1	No
Stamford Academy	Sep 2009	0	0	No
Sullivan Central High School	Aug 2010	1	0	No
Taft Union High School	Jan 2013	0	2	No
Virginia Randolph Community High School	Sep 2009	0	0	No
Walpole Elementary School	Feb 2012	0	0	No
Woodrow Wilson High School	Apr 2010	0	0	No

Notes: The above table lists the 44 shootings at U.S. primary and secondary schools included in our main analysis. We include schools that experienced their first shooting since April 1999 over our sample window (January 2008 to April 2013) and had at least one antidepressant prescription written by a provider within five miles of the school in each month in the two years surrounding the shooting. Source: *Washington Post* database on school shootings, downloaded on June 20, 2018.

Table S2: Effects of Fatal School Shootings on Youth Antidepressant Use by Grade Levels

	Baseline		High School Interaction	
	2-Year	3-Year	2-Year	3-Year
	(1)	(2)	(3)	(4)
Treatment x Post	0.213***	0.245***	0.0659	0.0532
	(0.0643)	(0.0787)	(0.0773)	(0.115)
Treatment x Post x High School			0.249**	0.306**
			(0.109)	(0.138)
Observations	1,412	1,410	1,412	1,410

Notes: The above table reports output from estimation of augmented versions of our difference-in-difference specification. We regress log antidepressant prescriptions for individuals under age 20 at the school–area–month level on an indicator denoting months in or after a school shooting; an interaction between the post indicator and an indicator denoting treatment areas; interactions between the post indicator, the treatment indicator, and an indicator denoting high schools (grades 9–12 only); month-by-year fixed effects; and school-by-area fixed effects. All regressions only consider fatal school shootings and are weighted by school enrollment. Standard errors (reported in parentheses) are clustered at the school-by-area level. For ease of comparison, Columns (1) and (2) replicate our baseline results from Table 2. Significance levels: * $p<0.1$ ** $p<0.05$ *** $p<0.01$

Table S3: Effects of Fatal School Shootings on Youth Antidepressant Use by Density of Mental Health Care Providers

	Baseline	Tercile Interactions		
	(1)	(2)	(3)	(4)
Treatment x Post	0.213***	0.290***	0.426***	0.452***
	(0.064)	(0.103)	(0.085)	(0.090)
Prescriber Density				
x Tercile 2		-0.189		-0.129
		(0.113)		(0.097)
x Tercile 3		-0.142		0.067
		(0.151)		(0.149)
Non-Prescriber Density				
x Tercile 2			-0.328**	-0.332**
			(0.122)	(0.124)
x Tercile 3			-0.348***	-0.399***
			(0.114)	(0.140)
Observations	1,412	1,412	1,412	1,412

The above table reports output from estimation of augmented versions of our difference-in-difference specification that include interactions between the post indicator, the treatment indicator, and terciles of county-level measures of the density of child mental health providers. "Prescribers" include physicians in pediatrics, psychiatry, or family medicine; "Non-Prescribers" include psychologists and social workers. All regressions consider fatal school shootings and use a two-year follow-up window. Refer to *SI Appendix*, Fig. S3 for event study analogs, and *SI Appendix*, Fig. S4 for correlations between the density measures. * p<0.1 ** p<0.05 *** p<0.01

Table S4: Effects of Fatal School Shootings on Youth Antidepressant Use by Local Area Violent Crime Rates

	Baseline	Linear Interaction	Tercile Interactions
	(1)	(2)	(3)
Treatment x Post	0.213***	0.167**	0.123*
	(0.064)	(0.075)	(0.061)
x Crime Rate		0.019	
		(0.025)	
x Mid-Tercile Crime Rate			0.120
			(0.127)
x Top-Tercile Crime Rate			0.140
			(0.136)
Observations	1,412	1,412	1,412

Notes: The above table reports output from estimation of augmented versions of our difference-in-difference specification. We regress log antidepressant prescriptions for individuals under age 20 at the school–area–month level on an indicator denoting months in or after a school shooting; an interaction between the post indicator and an indicator denoting treatment areas; interactions between the post indicator, the treatment indicator, and county-level measures of violent crime; month-by-year fixed effects; and school-by-area fixed effects. We include crime rates either as a continuous variable (Column (2)) or as indicators denoting terciles across treatment counties (Column (3)). The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions only consider fatal school shootings, use a two-year follow-up window, and are weighted by school enrollment. Standard errors (reported in parentheses) are clustered at the school-by-area level. For ease of comparison, Column (1) replicates our baseline results from Table 2. Significance levels: * p<0.1 ** p<0.05 *** p<0.01

Table S5: Effects of School Shootings on Youth Antidepressant Use: Wild Cluster Bootstrap

	Fatal Shootings		Non-Fatal Shootings	
	2-Year	3-Year	2-Year	3-Year
	(1)	(2)	(3)	(4)
A. Outcome: ln(Antidepressant Prescriptions)				
Treatment x Post	0.213**	0.245*	0.0187	0.0603
	[p=0.015]	[p=0.050]	[p=0.736]	[p=0.351]
B. Outcome: Antidepressant Prescription Rates per 1,000				
Treatment x Post	1.982**	2.645***	1.674	0.348
	[p=0.012]	[p=0.002]	[p=0.231]	[p=0.584]
Relative to Mean	0.206**	0.297***	0.163	0.037
Number of Schools	15	12	29	24
Observations	1412	1410	2601	2718

Notes: The above table reports output from estimation of our primary difference-in-difference specification. We regress measures of antidepressant prescriptions for individuals under age 20 at the school–area–month level on an indicator denoting months in or after a school shooting ("Post"), an interaction between the post indicator and an indicator denoting treatment areas, month-by-year fixed effects, and school-by-area fixed effects. We run separate regressions for fatal (Columns (1) and (2)) and non-fatal (Columns (3) and (4)) school shootings and include either a two-year (Columns (1) and (3)) or three-year (Columns (2) and (4)) follow-up window. In Panel A, the outcome is the log number of antidepressant prescriptions written to individuals under age 20; the reported coefficient in each column is therefore the percentage difference in the post-shooting change in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas. In Panel B, the outcome is the antidepressant prescription rate per 1,000 individuals under age 20; the reported coefficient in each column is therefore the difference in the post-shooting change in the antidepressant prescription rate per 1,000 individuals under age 20 between the treatment and reference areas. The third row in Panel B reports the effect size as a proportion of the sample mean of the outcome. The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions are weighted by school enrollment. We calculate $p-$values (reported in brackets) using a wild cluster bootstrap. Significance levels: * p<0.1 ** p<0.05 *** p<0.01

Table S6: Effects of Fatal School Shootings on Youth Antidepressant Use by Local Area Insurance Rates

	Baseline	Linear interactions			Tercile Interactions		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment x Post	0.213***	1.528*	0.343***	1.283	0.288***	0.426***	0.436***
	(0.064)	(0.797)	(0.090)	(0.760)	(0.104)	(0.085)	(0.093)
x Insurance Rate		-0.016*		-0.012			
		(0.009)		(0.009)			
x Non-Prescriber Density			-0.039**	-0.031**			
			(0.017)	(0.013)			
x Mid-Tercile Insurance Rate					-0.117		0.035
					(0.155)		(0.142)
x Top-Tercile Insurance Rate					-0.200*		-0.097
					(0.112)		(0.089)
x Mid-Tercile Non-Prescriber Density						-0.328**	-0.338**
						(0.122)	(0.128)
x Top-Tercile Non-Prescriber Density						-0.348***	-0.313***
						(0.114)	(0.102)
Observations	1,412	1,412	1,412	1,412	1,412	1,412	1,412

Notes: The above table reports output from estimation of augmented versions of our difference-in-difference specification. We regress log antidepressant prescriptions for individuals under age 20 at the school–area–month level on an indicator denoting months in or after a school shooting; an interaction between the post indicator and an indicator denoting treatment areas; interactions between the post indicator, the treatment indicator, and county-level measures of the share of the population under age 65 that has health insurance or county-level measures of the density of non-prescribing child mental health providers; month-by-year fixed effects; and school-by-area fixed effects. We include insurance rates and provider densities either as continuous variables (Column (2)-(4)) or as indicators denoting terciles across treatment counties (Column (5)-(7)). The treatment (reference) areas include providers practicing 0–5 (10–15) miles from an affected school. All regressions only consider fatal school shootings, use a two-year follow-up window, and are weighted by school enrollment. Standard errors (reported in parentheses) are clustered at the school-by-area level. For ease of comparison, Column (1) replicates our baseline results from Table 2. Significance levels: * p<0.1 ** p<0.05 *** p<0.01

C Alternative Reference Areas

Our baseline specification compares the number of antidepressant prescriptions written by providers practicing 0–5 miles from a school that experienced a shooting (treatment areas) to the number of antidepressant prescriptions written by providers practicing 10–15 miles away (reference areas). In this section, we examine the robustness of our results to using two alternative sets of reference areas.

The first set of alternative reference areas consists of antidepressant prescriptions written by providers practicing 0–5 miles from non-shooting schools that had the highest predicted probability of a shooting based on observable characteristics ("alternative reference areas A"). Specifically, we consider all primary and secondary schools in the United States and estimate a logistic regression of an indicator denoting whether each school experienced a shooting since 1999 on a range of school and district-level characteristics (see Table S7 below). We then select the 100 schools with the highest shooting propensities that are not in the same district as any school that experienced a shooting, separately for fatal and non-fatal shootings.

The second set of alternative reference areas consists of antidepressant prescriptions written by providers practicing 0–5 miles from non-shooting schools that were directly matched to schools that experienced a shooting based on observables ("alternative reference areas B"). In particular, we matched each shooting school to two non-shooting schools by doing an exact match on indicators for rural area, high school only, and private school. We then implemented a "nearest-neighbor" match procedure on the share of non-Hispanic white students, total enrollment, per-pupil expenditures, and the share of students receiving free or reduced-price lunch.

Table S8 below shows mean characteristics for both the treatment schools and for schools used to define alternative reference areas A and B. Alternative reference area B schools (Columns (3) and (6)) are more closely matched on observable characteristics to the shooting schools (Columns (1) and (4)) than alternative reference area A schools (Columns (2) and

(5)). The fact that alternative reference area A schools are less well matched suggests that shootings are relatively random events that are not well predicted by schools' observable characteristics. We believe that this provides further credibility to our research design that relies on variation in the exact timing of school shootings being exogenous to our outcomes of interest.

Panel C of Table 1 in the main paper shows mean antidepressant prescription rates across the treatment and reference areas. Out of all three reference areas, antidepressant use preceding a fatal school shooting in the treatments areas is most similar to antidepressant use in the primary reference areas.[1] This is a key reason why we prefer our primary reference areas and refer to this specification as the baseline model in the paper.

For analyses using these alternative reference areas, we estimate:

$$ln(RX_{st}) = \beta_0 + \beta_1 Post_t + \beta_2 Post_t \times Treat_s + \sigma_t + \gamma_s + \epsilon_{st} \quad (1)$$

where variables are defined analogously to Equation (1) in the Materials & Methods section of the main paper.[2] We cluster standard errors by school and weight the regressions by school enrollment.

Our results are robust to using either set of alternative reference areas. In particular, Fig. S9 below compares results from event-study specifications that use either our primary reference areas or one of the two alternative reference areas. Results are statistically indistinguishable across models. Furthermore, Table S9 below compares results from difference-in-difference regressions that use each of the three different reference areas. Again, the results are very similar.

[1] Note that we cannot distinguish pre- and post-shooting antidepressant rates for alternative reference area A. We collectively match all shooting schools to a set of non-shooting schools rather than matching shooting and non-shooting schools one-to-one, and thus there is no shooting date assigned to the non-shooting schools.

[2] As noted above, the method used to select non-shooting schools for alternative reference area A does not assign a shooting date to control schools. Since "Post" therefore equals zero for all observations for the control schools, "Post × Treat" is excluded from regressions using alternative reference areas A.

Table S7: Predicting School Shootings

Dep Var: Indicator Denoting School Shooting	Any (1)		Fatal (2)		Non-Fatal (3)	
Suburban	-0.474**	(0.183)	-0.702**	(0.218)	0.177	(0.356)
Town	-0.291	(0.252)	-0.261	(0.284)	-0.332	(0.546)
Rural	-0.485*	(0.239)	-0.738*	(0.294)	0.145	(0.440)
Per Pupil Expenditures ($10,000s)	-0.022	(0.450)	-0.178	(0.521)	0.410	(0.870)
Per Pupil Instructor Expenditures ($10,000s)	-1.370	(0.884)	-1.125	(1.005)	-2.235	(1.804)
District Socioeconomic Status	-0.189	(0.129)	-0.191	(0.152)	-0.165	(0.245)
District 3rd-8th Academic Achievement (Mean)	0.231	(0.410)	0.537	(0.484)	-0.652	(0.770)
District 3rd-8th Academic Achievement (Slope)	-2.451	(1.844)	-2.030	(2.108)	-4.503	(3.699)
Total Enrollment (1000s)	0.816**	(0.085)	0.728**	(0.100)	0.982**	(0.127)
Private School	-0.898**	(0.322)	-1.229**	(0.430)	-0.305	(0.499)
Share White Students	-2.594**	(0.606)	-2.912**	(0.724)	-1.888*	(1.076)
Share Black Students	0.015	(0.567)	0.179	(0.670)	-0.664	(1.054)
Share Hispanic Students	-2.014**	(0.616)	-2.190**	(0.733)	-1.464	(1.093)
Share Asian Students	-6.292**	(1.840)	-5.213**	(1.924)	-10.488*	(4.707)
Share Free/Reduced Price Lunch	-1.391**	(0.430)	-1.223*	(0.503)	-2.110**	(0.815)
High School Only	1.424**	(0.159)	1.614**	(0.185)	0.962**	(0.297)
Constant	-3.581**	(0.678)	-3.749**	(0.796)	-5.099**	(1.272)
R-Squared	0.153		0.166		0.110	
Number Schools	117306		117250		117148	

Notes: The above table reports output from logistic regressions of an indicator denoting whether a school experienced a school shooting since 1999 on a range of school and district-level characteristics. The sample includes all primary and secondary schools in the United States. We run separate regressions for all (Columns (1)), fatal (Column (2)), and non-fatal (Columns (3)) school shootings. Note that the race/ethnicity categories are not mutually exclusive. Standard errors are reported in parentheses. Significance levels: * p<0.1 ** p<0.05 *** p<0.01

Table S8: Characteristics for Shooting Schools and Matched Non-Shooting Schools

	Fatal			Non-Fatal		
	Shooting Schools	Alternative Reference A Schools	Alternative Reference B Schools	Shooting Schools	Alternative Reference A Schools	Alternative Reference B Schools
	(1)	(2)	(3)	(4)	(5)	(6)
Total Enrollment (1000s)	1.22	3.38	1.21	0.90	2.27	0.9
Private School	0.13	0.00	0.13	0.07	0.00	0.07
High School	0.40	0.94	0.40	0.55	0.98	0.55
Share White	0.49	0.25	0.48	0.43	0.11	0.43
Share Black	0.17	0.24	0.26	0.37	0.71	0.28
Share Free/Reduced Lunch	0.43	0.56	0.44	0.51	0.62	0.51
Number of Schools	15	70	30	29	100	57

Notes: The above table reports average characteristics for shooting and non-shooting schools in our two alternative reference areas, separately for schools in the fatal and non-fatal shooting analyses. "Alternative Reference A Schools" are schools with the highest predicted probability of a shooting based on their school characteristics. "Alternative Reference B Schools" were matched to schools that experienced a shooting based on observable characteristics. See the text for more details.

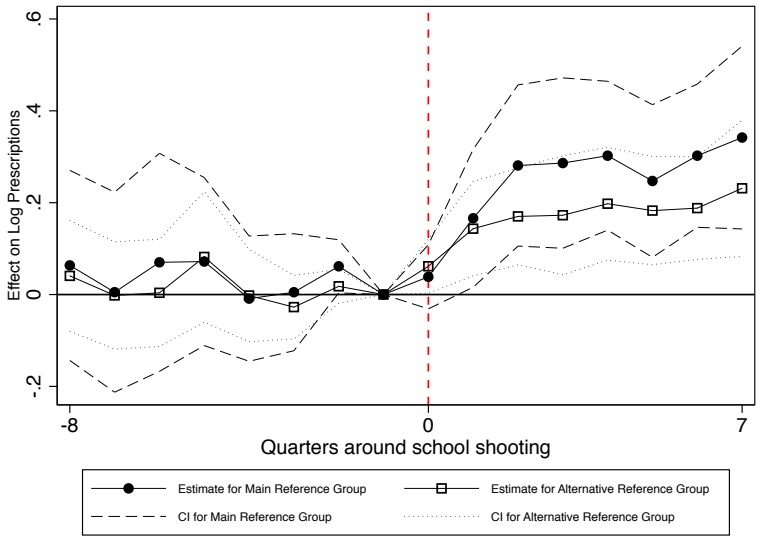
Table S9: Effects of School Shootings on Youth Antidepressant Use: Alternative Reference Areas

	Fatal Shootings		Non-Fatal Shootings	
	2-Year	3-Year	2-Year	3-Year
	(1)	(2)	(3)	(4)
A. Primary Reference Areas				
Treatment x Post	0.213***	0.245***	0.0187	0.0603
	(0.064)	(0.079)	(0.060)	(0.053)
Schools	15	12	29	24
Observations	1,412	1,410	2,601	2,718
B. Alternative Reference Areas A				
Treatment x Post	0.154***	0.165***	-0.0145	0.00192
	(0.0450)	(0.0449)	(0.0521)	(0.0461)
Schools	114	112	129	124
Observations	11,643	11,547	12,326	12,086
C. Alternative Reference Areas B				
Treatment x Post	0.156***	0.183***	0.0105	0.0558
	(0.0516)	(0.0563)	(0.0610)	(0.0625)
Schools	43	41	84	79
Observations	2,064	2,388	4,009	4,608

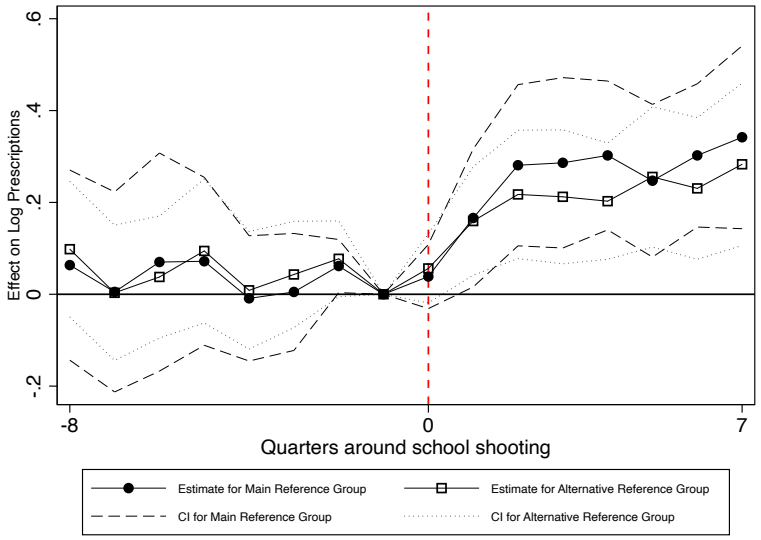
Notes: The above table reports output from the estimation of our primary difference-in-difference specification (Panel A) and difference-in-difference specifications using alternative reference areas (Panels B and C). In Panel B, the alternative reference group consists of providers practicing 0–5 miles from the 100 non-shooting schools that had the highest predicted probability of a shooting based on observable characteristics. In Panel C, the alternative reference group consists of providers practicing 0–5 miles from non-shooting schools that were directly matched to the shooting schools based on observable characteristics. Using these alternative reference areas, we regress log monthly antidepressant prescriptions written for individuals under age 20 by providers practicing 0–5 miles from a school on an indicator denoting months in or after a school shooting, month-by-year fixed effects, and school fixed effects. We run separate regressions for fatal (Columns (1) - (2)) and non-fatal (Columns (3) and (4)) school shootings and include either a two-year (Columns (1) and (3)) or three-year (Columns (2) and (4)) follow-up window. The reported coefficient in each column represents the percentage difference in the post-shooting change in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas. All regressions are weighted by enrollment of the treatment schools. Standard errors (reported in parentheses) are clustered at the school-by-area level in Panel A and at the school level in Panels B and C. Significance levels: * $p<0.1$ ** $p<0.05$ *** $p<0.01$

Figure S9: Sensitivity of Estimates to Using Alternative Reference Areas

(a) Fatal Shootings, Alternative Reference Areas A



(b) Fatal Shootings, Alternative Reference Areas B



Notes: The above figures present overlaid output from estimation of our primary event study specification and event studies using alternative reference areas. In subfigure (a), the alternative reference group consists of providers practicing 0–5 miles from the 100 non-shooting schools that had the highest predicted probability of a shooting based on observable characteristics. In subfigure (b), the alternative reference group consists of providers practicing 0–5 miles from non-shooting schools that were directly matched to the shooting schools based on observable characteristics. For each specification, we plot coefficients and 95% confidence intervals that represent the percentage difference in the post-shooting change in the number of antidepressant prescriptions written to individuals under age 20 between the treatment and reference areas. All regressions only consider fatal school shootings and are weighted by enrollment of the treatment schools. Standard errors are clustered at the school-by-area level in our main specification and at the school level when using the alternative reference areas.

D School Attendance Boundaries

We obtain data from the 2013–2014 School Attendance Boundary Survey to calculate average school attendance areas for schools included in our analysis. Out of the 44 schools included in our sample, 25 have valid school attendance boundary data (note that the district response rate to the survey was around 75 percent). For these 25 schools, the average school attendance area is approximately 80 square miles.

When we use a 5-mile radius to define treatment areas, we obtain an area size of $\pi * 5^2 = 78.5$ square miles. Thus, our treatment areas are likely to include most students who reside within the shooting schools' attendance boundaries (and who may therefore also see providers who are located in these areas). By contrast, our reference areas of 10–15 miles from schools that experienced a shooting are unlikely to include students who reside within the attendance boundaries of those schools.

E Data Availability

Prescription data

Access to the IQVIA Xponent database is restricted to researchers with data use agreements only. Interested researchers may contact IQVIA to inquire about purchasing the data at:
`https://www.iqvia.com/solutions/real-world-evidence/real-world-data-and-insights`

School shootings data

The *Washington Post* school shootings database can be downloaded at:
`https://github.com/washingtonpost/data-school-shootings`

Population data

Census block group–level population counts from the census can be downloaded at:
`https://www.socialexplorer.com`

School and district characteristics

Information on school and district characteristics from the Stanford Education Data Archive can be downloaded at:
`https://exhibits.stanford.edu/data/catalog/db586ns4974`

Mental health care resources

Data on county-level mental health care resources from the Centers for Disease Control and Prevention can be downloaded at:
`https://www.cdc.gov/childrensmentalhealth/stateprofiles-providers.html`

Crime rates

Data on county-level violent crime rates from the Uniform Crime Reporting Program can be downloaded at:
`https://www.icpsr.umich.edu/icpsrweb/NACJD/studies/23780`

Health insurance rates

Data on county-level health insurance coverage rates from the American Community Survey can be downloaded at:
`https://www.socialexplorer.com`