

Behavioral Responses to Mass Shootings

Physical Activity, Mental Health and Labor Outcomes

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Motivation

High profile acts of violence

- Low probability, high saliency crimes

Who is impacted?

- Direct vs indirect exposure

Δ in behavior \rightarrow external cost on society?

How do individuals cope with experiences of insecurity?

What is the impact on behavior of indirect exposure to Public Mass Shootings?

$$\Delta \text{ Behavior} = f(\text{Exposure to Public Mass Shootings})$$

Preview of Results

- Short-term behavior
- Physical activity
- Drinking behaviors
- Hours worked

Effects on mental health

- Bowman et al. (2004), Littleton et al., (2011), Cornalga, et al. (2014), Metcalfe et al., (2011), Dustmann and Fasani (2016), Rubin et al. (2005), Lowe and Galea, (2017), Bor et al. (2018), Brewin et al. (2000), Tolin et al. (2006)

Consumer choice, health behaviors, education, work

- Becker and Rubinstein (2011), Kling et al. (2004), Hamermesh (1998), Clark and Stancanelli (2018)
- Janke et al. (2016), Ang (2020), Gomez et al. (2004), Rossin-Slater et al. (2020)

Who is affected?

- Direct vs indirect victims

Number of events being studied

How are changes in activity being measured?

Mass Shooting Definition

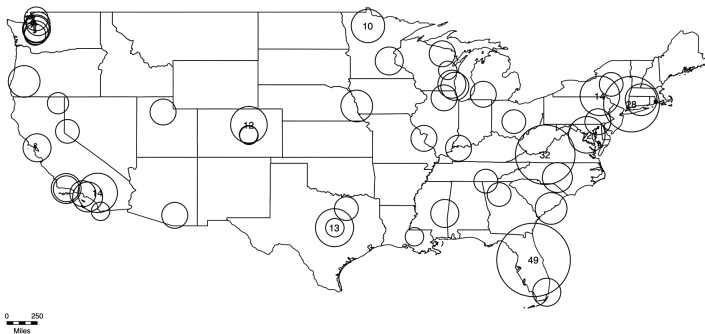
“Indiscriminate rampages in public places resulting in four or more victims killed by the attacker. Excluding shootings stemming from more conventionally motivated crimes such as armed robbery or gang violence.”

- Difficult to predict
- High saliency
- Not related to local crime rates

Why not use shootings?

- Exposure to local crime
- Prediction
- Neighborhood

Mass Shootings in the United States 2003-2016



Note: Circles are proportional to the number of fatalities in each event. Only events above 9 fatalities have a number in the figure for presentation purposes. Source: MJ U.S. Mass Shootings from 2003 to 2016.

Mass Shootings

- Problem with Mass Shootings
 - No official data!
 - Are people getting exposed to information on MSI?
- Saliency of incidents

Empirical Challenge

$$\Delta \text{ Behavior} = f(\text{Exposure to Public Mass Shootings})$$

Questions

- Level of exposure to mass shootings?
- Do people search more for mass shootings on Internet?
- Do activity levels change?
- Hours worked?
- Risky health behaviors?

Five main sources of data:

- Mother Jones Investigation on MSI, 2003-2016
- Google Trends, 2011 to 2015
- American Time Use Survey (ATUS), 2003-2016
- Behavioral Risk Factor Surveillance Survey, 2003-2016
- Current Population Survey, 2003-2016

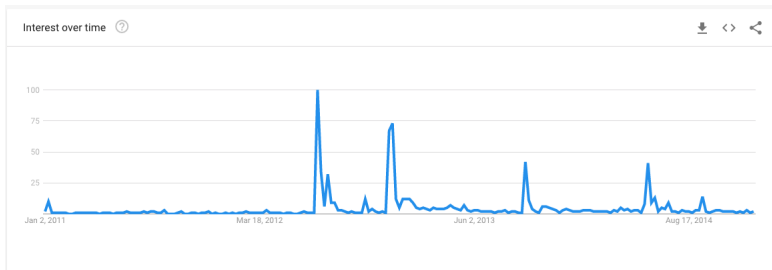
Mother Jones Investigation on Mass Shootings

- Media reports
- MSI with at least 4 fatalities without including the perpetrator
- Open-source database
- Excludes shootings from conventional crimes → local crime patterns

Google Trends

- Normalized measure of how much people are searching in Google by geographic unit and period
- Designated Market Areas
- Information on how salient MSI are, do people search more?
- Geographical proximity vs time

Google Trends for searching “mass shooting”:



American Time Use Survey

- Time diaries: what, where, when and who they do activities with
- Metabolic equivalents of task (MET)
 - Ratio of a person's working metabolic rate relative to their basal metabolic rate
 - 1 MET would be the equivalent in energy that is required to sit quietly
 - *Sedentary Activities*: 0 to 1.5 MET
 - *Light Activities*: 1.5 to 3 MET
 - *Moderate and Vigorous Activities*: $MET > 3$

BRFSS, 2003-2016

- Self-perceived mental health:

“Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?”

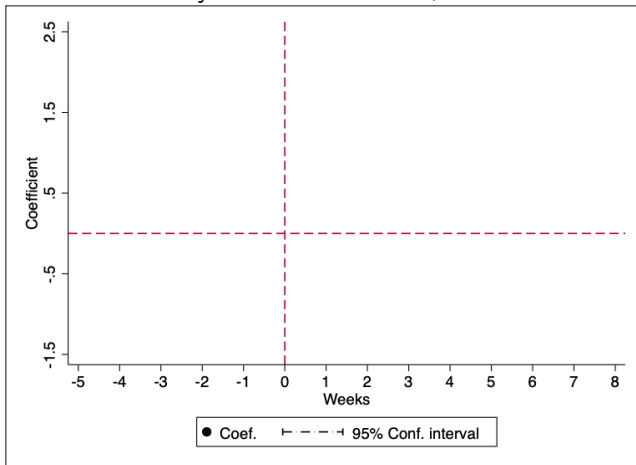
- Drinking behaviors

CPS, 2003 - 2016

- Hours worked

Mass Shootings and Google Trends

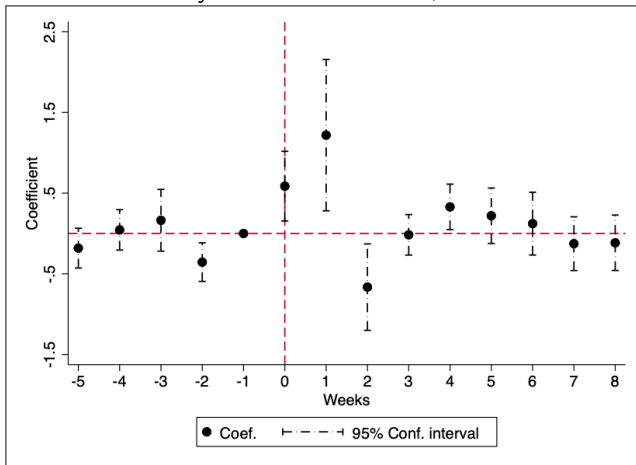
Search Interest by distance in weeks, 250 miles



Notes: Models include year, week, Designated Market Area (DMA) fixed effects. The omitted category is $t - 1$. Dots in the graphs denote the estimated equation coefficients and spikes show the 95% confidence intervals which utilize robust standard errors clustered at the DMA level. Search interest values come from averaging 100 sample draws from Google Trends. Source: Author estimations using Google Trends data (www.google.com/trends) from 2011 to 2015.

Mass Shootings and Google Trends

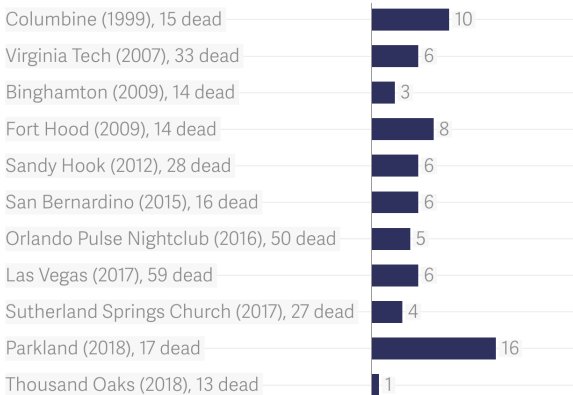
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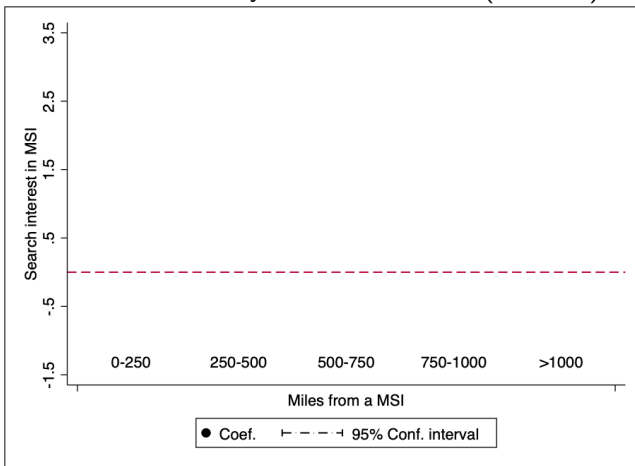
Media Coverage: New York Times

Days Mass Shootings Were on the Front Page of the New York Times



Mass Shootings and Google Trends Results

Search Interest by distance in miles (2 weeks)

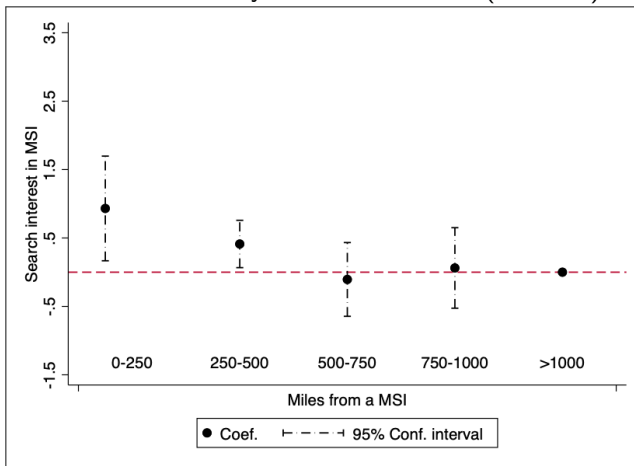


Notes: Models include year, week, Designated Market Area (DMA) fixed effects. The omitted category are individuals who live 1000 or more miles away from an incident. Dots in the graphs denote the estimated equation coefficients and spikes show the 95% confidence intervals which utilize robust standard errors clustered at the DMA level.

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Mass Shootings and Google Trends Results

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Methods

I use exogenous variation in time and geographical location of MSI. Main estimating equation:

$$y_{ict} = \beta_0 + \beta_1 MSI_{ct} + \delta_{ict} X_{ict} + \gamma_t + \alpha_c + \eta + \phi_t + \epsilon_{ict}$$

- MSI_{ct} 1 if a mass shooting has happened within 2 weeks and 250 miles.
- Fixed effects: Year-week γ_t , Day of the week ϕ_t , County α_c , state-month η .
- Control for daily temperature, hours of sunlight at the State level and each State's violent crime rates

Results for Overall Activity

	(1)	(2)	(3)
<hr/> <hr/> Panel A: Metabolic Equivalents of Task Logarithm			
MSI within 250 miles	-0.018*** (0.007)	-0.017** (0.007)	-0.017*** (0.006)
Mean	3.618		
Standard Deviation:	0.176		
Fixed Effects	Yes	Yes	Yes
Sociodem. Charact.	No	Yes	Yes
Temperature and Hours of Sunlight	No	No	Yes
Last Year Violent Crime Rate	No	No	Yes
Observations	78,638	78,638	78,638

Notes: * .10 ** .05 *** .01 sig. levels. Estimations include year-week, day of the week, county and state-month fixed effects. Robust standard errors clustered at the county level. Author estimations using ATUS data from 2003 to 2016.

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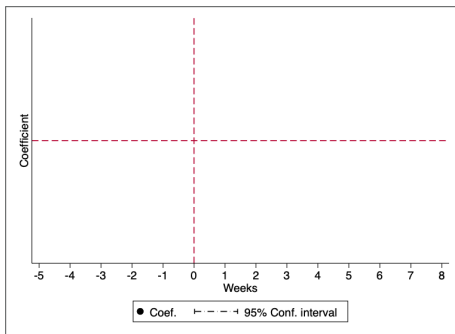
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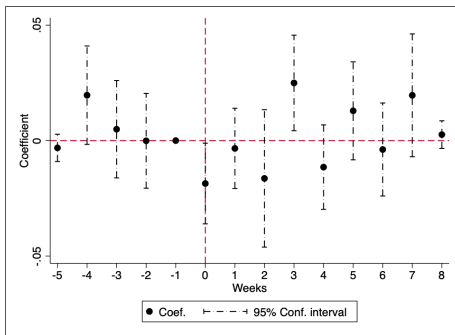
Figure: Activity levels by distance in weeks



Notes: Models include year-week, county and state-month fixed effects.
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Results for overall activity

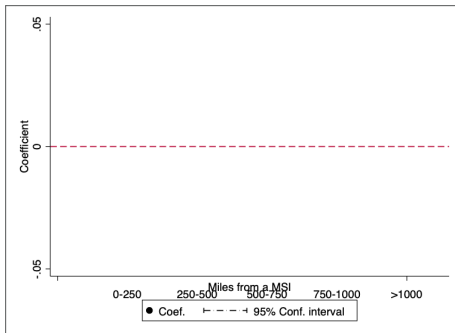
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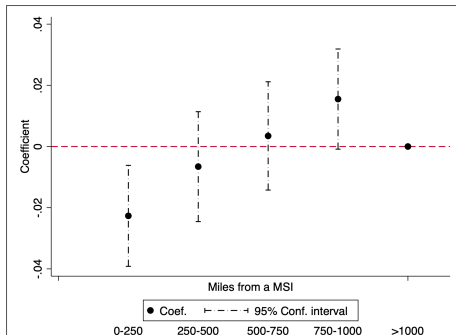
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Results for overall activity

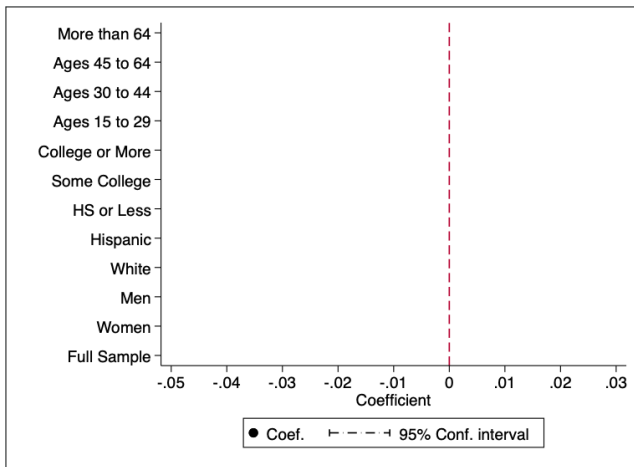
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Heterogeneous Results for Overall Activity

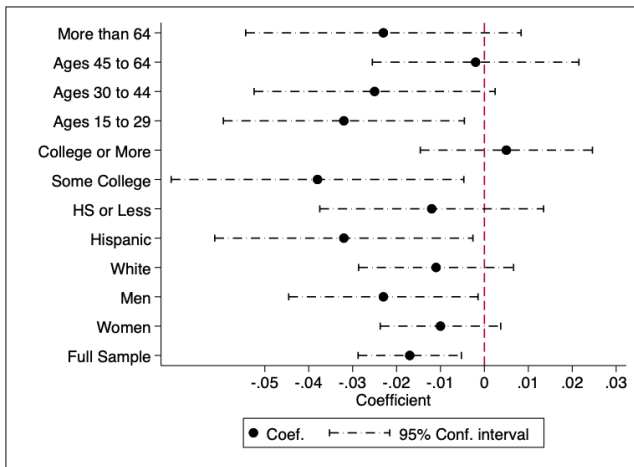
Figure: Ln(MET) by Observable Characteristics



Notes: * .10 ** .05 *** .01 sig. levels using q-values that control for false discovery rate (Anderson, 2008). Robust standard errors clustered at the county level. Estimations include year-week, day of the week, county and state-month fixed effects. Author estimations using ATUS data from 2003 to 2016.

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Other Activity Results

	(1)	(2)	(3)
<u>Panel A: Minutes of Moderate and Vigorous Activities</u>			
MSI within 250 miles	-10.944*	-9.093*	-9.029*
	(5.661)	(5.346)	(5.345)
Mean	91.038		
<u>Panel B: Minutes at Home</u>			
MSI within 250 miles	2.467	5.212	5.214
	(13.224)	(12.803)	(12.790)
Mean	443.051		
<u>Panel C: Minutes in Public Places</u>			
MSI within 250 miles	-13.110	-14.426	-14.409
	(14.150)	(13.878)	(13.863)
Mean	389.394		
Fixed Effects	Yes	Yes	Yes
Sociodem. Charact.	No	Yes	Yes
Weather and State Violent Crime Rates	No	No	Yes
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Hours Worked

Table: Estimation Results for Hours Worked

	(1)	(2)
Panel A: Hours Worked Last Week		
MSI within 250 miles	-0.184** (0.073)	-0.177** (0.070)
Mean	38.500	
Panel B: Hours Worked Last Week (Main Job)		
MSI within 250 miles	-0.132* (0.070)	-0.126* (0.068)
Mean	37.877	
Panel C: Hours Worked Last Week (Other Jobs)		
MSI within 250 miles	-0.048** (0.020)	-0.046** (0.020)
Mean	0.665	
Year-Month Fixed Effects	Yes	Yes
State-Month Fixed Effects	Yes	Yes
County Fixed Effects	Yes	Yes
Sociodem. Charact.	No	Yes
Observations	4,176,782	4,176,782

Notes: * .10 ** .05 *** .01 sig. levels. Robust standard errors clustered at the county level.
Author estimations using CPS data from 2003 to 2016.

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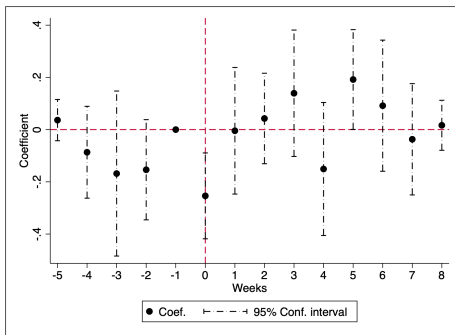
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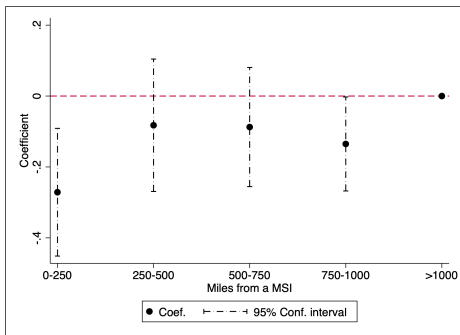
Figure: Hours worked by distance in weeks



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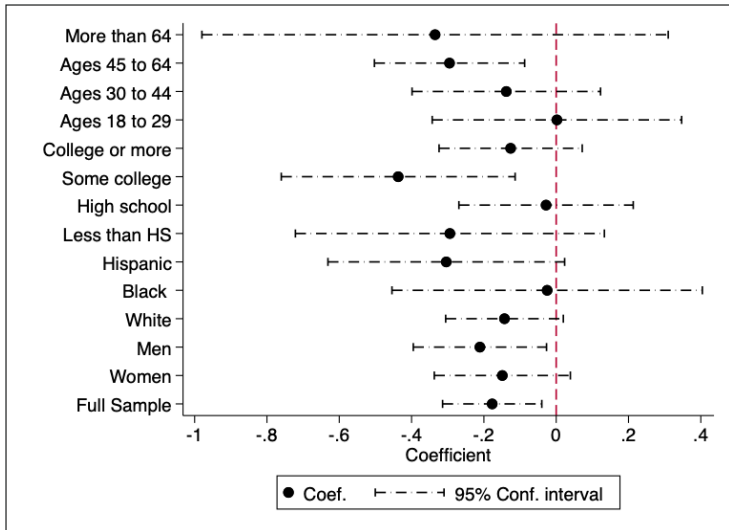
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Hours Worked by Observable Characteristics



Perceived Mental Health
Drinking Behaviors

Mental Health Outcomes

	(1)	(2)
<u>Panel A: Days of Poor Mental Health</u>		
MSI within 250 miles in the last 30 days	0.064 (0.086)	0.063 (0.079)
Mean		3.698
<u>Panel B: Days of Poor Mental Health, Extensive Margin</u>		
MSI within 250 miles in the last 30 days	-0.004 (0.005)	-0.004 (0.004)
Mean		0.345
<u>Panel C: Days of Poor Mental Health, Intensive Margin</u>		
MSI within 250 miles in the last 30 days	0.320* (0.180)	0.348** (0.173)
Mean		10.733
<u>Panel D: Frequent Mental Distress</u>		
MSI within 250 miles in the last 30 days	0.004 (0.003)	0.004 (0.003)
Mean		0.114
Year-Week Fixed Effects	Yes	Yes
State-Month Fixed Effects	Yes	Yes
State Fixed Effects	Yes	Yes
Day of the Week Fixed Effects	Yes	Yes
Sociodem. Charact.	No	Yes
Observations	5,147,060	5,147,060

Notes: * .10 ** .05 *** .01 sig. levels. Robust standard errors clustered at the state level. Author estimations using BRFSS data from 2003 to 2016.

Drinking Outcomes

	(1)	(2)
<hr/> <hr/>		
Panel A: Drinks per month		
MSI within 250 miles in the last 30 days	0.414 (0.394)	0.445 (0.348)
Mean		12.260
Panel B: Binge Drinker		
MSI within 250 miles in the last 30 days	0.008* (0.004)	0.008** (0.003)
Mean		0.160
Year-Week Fixed Effects	Yes	Yes
State-Month Fixed Effects	Yes	Yes
State Fixed Effects	Yes	Yes
Day of the Week Fixed Effects	Yes	Yes
Sociodem. Charact.	No	Yes
Observations	5,147,060	5,147,060

Notes: * .10 ** .05 *** .01 sig. levels. Robust standard errors clustered at the state level. Author estimations using BRFSS data from 2003 to 2016.

Concluding Remarks

What we did not know

- How salient are mass shootings?
- Novel measure of changes in behavior
- Effect of indirect exposure to mass shootings on behavior
- External cost to society

What we know now

- Short term behaviors
- Activity levels
- Sub-populations
- Mental health and drinking behaviors
- Coping mechanisms

Cost on Society?

Implications

- Forgone wages: \$7 decrease per week in 2016, Orlando (418 million)
- Risky behaviors, substance abuse
- Coping mechanism

Policy Implications

- ① Define it
- ② Measure it
- ③ Acknowledge its impact on overall society
- ④ Open research
- ⑤ Mental health interventions in local communities
- ⑥ Prevention, gun access

Next Steps

- Facebook Social Connectedness Index
- Drug prescriptions
- Consumption patterns
- Specific events
- Risky behaviors, substance abuse
- Work leave

Thank you!