The effect of mass shootings on daily emotions is limited by time, geographic proximity, and political affiliation

Patrick Sharkey[a] **and Yinzhi Shen**[b,1]

[a]Princeton School of Public and International Affairs, Princeton University, Princeton, NJ 08544; and [b]Office of Population Research, Princeton University, Princeton, NJ 08544

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Media coverage in the aftermath of mass shootings frequently documents expressions of sadness and outrage shared by millions of Americans. This type of collective emotion can be a powerful force in establishing shared objectives and motivating political actions. Yet, the rise in mass shootings has not translated into widespread legislative progress toward gun control across the nation. This study is designed to shed light on this puzzle by generating causal evidence on the temporal and geographic scale of collective emotional responses to mass shootings. Using a unique continuous survey on Americans' daily emotions without reference to specific events, our empirical strategy compares the daily emotions of residents interviewed after to those interviewed before 31 mass shootings within the same city or state where the event occurred. We found that the emotional impact of mass shootings is substantial, but it is local, short-lived, and politicized. These results suggest that if policy reform efforts are to draw on collective emotional responses to these events, they will likely have to start at the local level in the immediate aftermath of a mass shooting.

mass shooting | gun violence | collective emotion | gun reform

A clear, anomalous spike stands out in the middle of Fig. 1, a graph showing the percentage of Americans who reported feeling sadness in the previous day as measured with a daily survey conducted with a national sample of Americans from 2008 through 2016. Over this entire period, the highest point in the graph is on the 15th of December in 2012 when close to 40% of respondents reported feeling sadness in the day prior, which is well more than double the percentage on a typical day. One day earlier, on December 14, 2012, a young man entered Sandy Hook Elementary School in Newtown, Connecticut, and killed 20 children and 6 adults before killing himself.

The shooting in Newtown, Connecticut is perhaps the most horrific example of a mass shooting; an extreme form of violence that has grown more common even as the overall level of violence in the United States has fallen (1). Mass shootings are typically defined as incidents where a shooter kills at least three or four people (not including the shooter) in a public place in a single period of time, and the act is not carried out as part of any other criminal activity. Although it is rarely possible to infer a shooter's intent, the definition is designed to capture incidents of violence for the sake of violence. Mass shootings represent a small fraction of all gun violence, but they have a unique impact on the public's consciousness because they usually take place in public spaces, they often appear to be indiscriminate or random, and they generate more extensive media attention than typical acts of gun violence. Unlike most acts of gun violence, which generate an intense emotional response from individuals connected with the victim or perpetrator, the emotional response to mass shootings is much more likely to be experienced collectively. For this reason, they provide a window into the way that public tragedies affect the emotions of individuals over an entire city, a state, or the nation as a whole.

Evidence on the emotional responses to mass shootings also provides a way to advance scholarly understanding of the impact of mass shootings on gun policy and gun politics. The shock, sadness, and anger felt in the aftermath of Sandy Hook was shared and expressed by millions of Americans and their political representatives. Research on emotion and social movements finds that this type of collective emotion is often a powerful force in establishing shared objectives and motivating action to achieve goals in social movements and other political behavior (2–6). Yet, the wave of collective emotions expressed in the aftermath of Sandy Hook and other mass shootings has not translated into a widespread legislative effort toward gun control. Although mass shootings lead to an increase in the number of bills related to firearm accessibility and restrictions that are introduced in state legislatures (7), Luca et al. found that the occurrence of a mass shooting in a state is associated with no significant increase in the passage of firearm restrictions in Democrat-controlled legislatures and is associated with more laws enacted to loosen firearm restrictions in states with Republican-controlled legislatures (7).

This article is designed to help explain this puzzle by generating causal evidence on the temporal and geographic scale of collective emotional responses to mass shootings. We draw on data from a survey of Americans' daily emotions to assess how feelings of sadness, anger, and happiness and reports of smiling or laughing change for groups of people living in the same town or city and in the same state as a mass shooting and how those changes persist or fade over time. The survey is useful because it is carried out continuously and does not reference specific events, thus providing a way to assess the degree to which an event like a mass shooting is forefront on the minds of respondents without priming. Using methods that exploit exogenous variation in the relative timing of events and interview

Significance

Our study provides causal evidence of how a mass shooting affects the emotions of residents throughout the city and state where the event occurred. We found that mass shootings have a strong impact on the emotions of individuals, but the impact is politicized, limited to individuals living within the town or city where the incident occurs, and fades within a week of the incident. The findings provide evidence on the full emotional toll of mass shootings while also offering insights into the link between mass shootings and gun politics.

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[1]To whom correspondence may be addressed. Email: yinzhis@princeton.edu.

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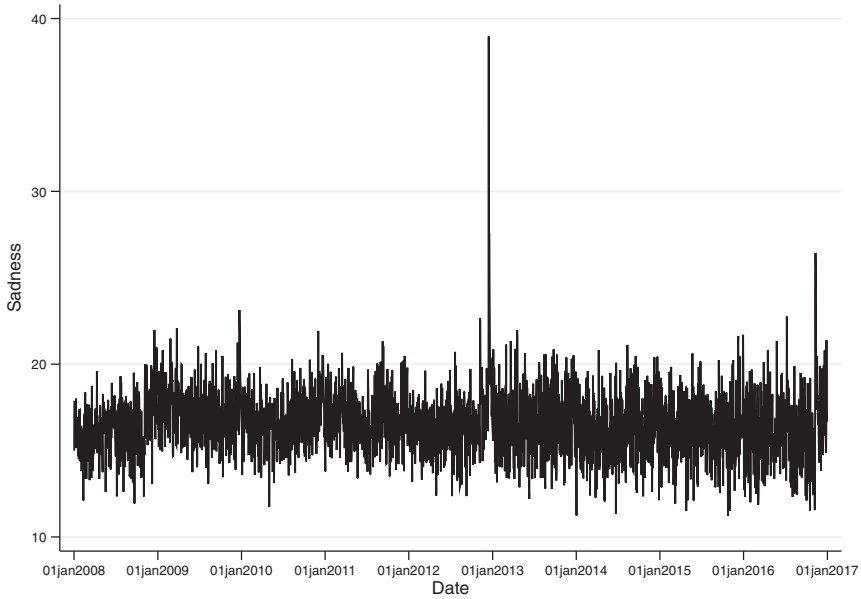

Fig. 1. The percentage of respondents to the Gallup US Daily survey reporting feeling sadness during the previous day.

assessments, the analysis provides causal evidence on the impact of mass shootings on collective emotions.

We have two motivations for the analysis. The first goal is to identify the effect of mass shootings on emotions in order to understand the full impact of these events across entire communities and states. The second goal is to estimate the effect of mass shootings for respondents with different political affiliations and to provide suggestive evidence to help explain why these events, and the collective emotions they generate, have not led to substantive advancement in gun control.

Results

The analyses are based on data showing the location and timing of mass shootings with at least four fatalities, occurring in the United States from 2008 through 2016. Because definitions of mass shootings vary, we carry out the main analysis on 31 incidents included in three different data sources that track mass shootings over time. Data on mass shootings were merged, by location, with data on daily emotions from the Gallup US Daily, a survey conducted with a national sample of American adults on a daily basis from 2008 through 2016.

The first set of analyses was conducted at the level of towns/cities. The estimated effect of the mass shooting is identified by comparing the emotions of individuals interviewed at different periods of time after the shooting to individuals in the same town/city who were interviewed in the 4 wk before the incident, with controls for respondent sociodemographic characteristics as well as the day

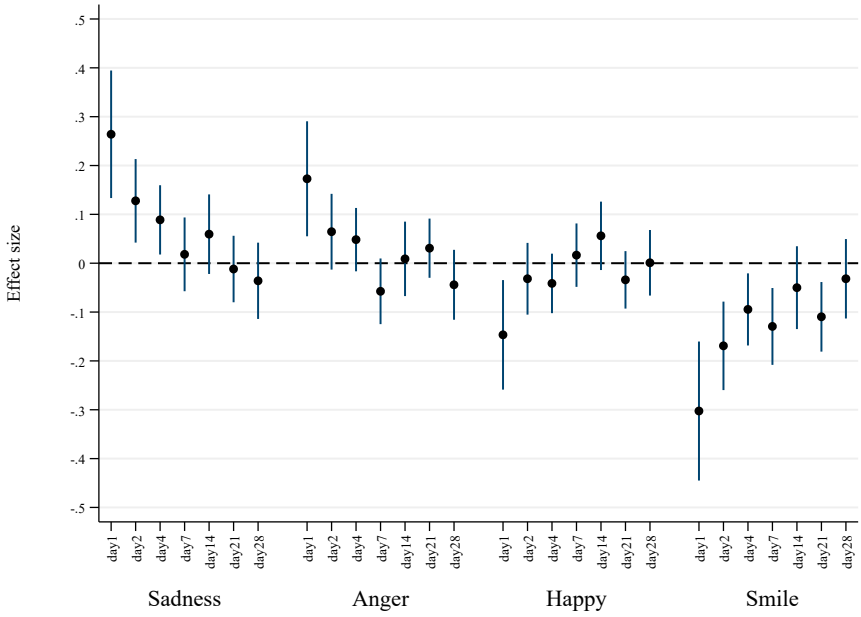

Fig. 2. The effect of mass shootings on daily emotions in the town/city of the event. Bars are 90% CIs.

of the week, the month of the year, and the year in which the interview was conducted. The respondents' sociodemographic characteristics account for any observed difference in the composition of individuals interviewed before and after the incident. The time-fixed effects account for temporal trends in emotions. The central assumption is that the relative timing of interview assessments and mass shootings is exogenous among individuals who live in the same location. In the *SI Appendix*, we provide evidence to support this assumption.

Fig. 2 shows the effect of mass shootings on feelings of sadness, anger, and happiness and expressions of smiling/laughing in the previous day with a 90% CI, ranging from 1 to 28 d after the incident (no analyses showed a meaningful impact beyond 28 d). The effect size measures the difference in the probability of experiencing a specific emotion "a lot" in the previous day between respondents interviewed after the incident (the treatment group) and those interviewed in the 4 wk before the incident (the control group). The effect size on day 1 captures the immediate effect of mass shooting on emotions on the day of the incident. Starting from day 2, we estimated a 3-d average effect to reduce the impact of statistical noise on our estimation.

The sequence of analyses begins with a focus on feelings of sadness. Compared to respondents in the control group, respondents who lived in the same town/city but were interviewed on the day after a mass shooting were substantially more likely to report feelings of sadness in the previous day. Exposure to a mass shooting in the day prior to the interview led to a 26-percentage-point increase in the probability of feeling sadness in the previous day. Respondents in the treatment group were roughly 2.7 times as likely to report feelings of sadness when compared to those in the control group. The effect of mass shootings on sadness in the previous day remained statistically different from zero for 4 d after the incident, but the magnitude of the effect dropped very quickly. After roughly 1 wk, the effect was no longer statistically different from zero.

A similar pattern was found with feelings of anger, although the effect did not persist for as long as feelings of sadness. Whereas about 12% of respondents in the control group reported feeling anger yesterday, exposure to a mass shooting in the day prior to the interview led to a 17-percentage-point increase in the probability of feeling anger. The effect of mass shootings on anger quickly faded afterward. Respondents interviewed 1 to 3 d after a mass shooting, on average, were no more likely than the control group to report feelings of anger in the previous day.

Feelings of happiness declined in the immediate aftermath of mass shootings and then quickly returned to baseline levels. While just over 90% of respondents in the control group reported feeling happy yesterday, exposure to a mass shooting in the day prior to the interview led to a 15-percentage-point decline in the probability of feeling happy. However, respondents interviewed 1 to 3 d after a mass shooting, on average, were no less likely than the control group to report feelings of happiness in the previous day.

Reports of smiling or laughing a lot yesterday declined sharply in the aftermath of mass shootings, and the impact persisted for a longer period of time than for other emotional responses. Roughly 86% of respondents in the control group reported laughing or smiling a lot in the previous day. Exposure to a mass shooting in the day prior to the interview reduced the probability of smiling or laughing a lot yesterday by 30 percentage points. The effect became weaker over time, but respondents interviewed around 3 wk (i.e., 20 to 22 d) after a mass shooting were still 11 percentage points less likely to report smiling/laughing in the previous day than the control group. After 4 wk, reports of smiling or laughing among the treatment group returned to the baseline levels.

The initial set of analyses reveal a very clear temporal pattern showing the stages of emotional response in the aftermath of a mass shooting for those living in the town/city of the incident. In the day after a mass shooting, individuals are much more likely to report sadness and anger and much less likely to report happiness and smiling or laughing in the previous day. The magnitude of the immediate impact is clear and striking. However, for most people living near mass shootings, daily emotions return to normal levels within days of the event, with the exception that people are less likely to smile or laugh a lot for up to 3 wk after the event.

The Geographic Scope of Collective Emotional Responses. Given that state governments are the primary regulators of firearms (7), it is important to move the geographic scope of the analysis beyond the local level. Fig. 3 plots the impact of mass shootings on emotions

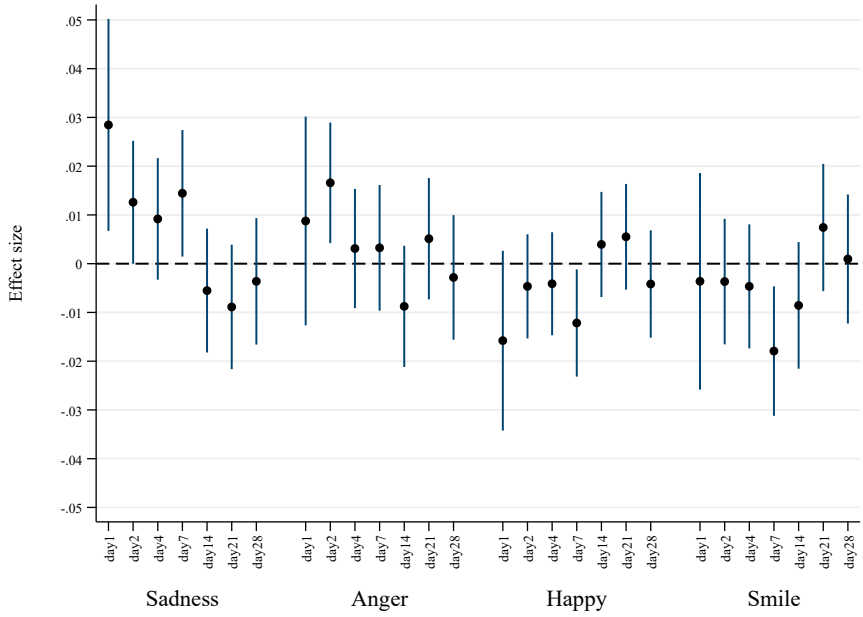

Fig. 3. The effect of mass shootings on daily emotions in the state of the event. Bars are 90% CIs.

of individuals throughout the state where events occurred. In contrast to the results at the town/city level, the impacts of mass shootings were substantially smaller at the state level. Respondents interviewed in the day after a mass shooting were 2.8 percentage points more likely than respondents in the control group to report feelings of sadness in the previous day. Respondents interviewed 1 to 3 d after a mass shooting were 1.7 percentage points more likely than respondents in the control group to report feelings of anger in the previous day. Respondents interviewed 6 to 8 d after a mass shooting were 1.4 percentage points more likely to report feelings of sadness, 1.2 percentage points less likely to report feelings of happiness, and 1.8 percentage points less likely to report smiling/laughing in the previous day. No other statistically significant effects were found at the state level other than anomalous point estimates that are likely to represent noise.

One possible explanation for the relatively small impact of mass shootings at the state level is that some events may not generate much attention outside of the city or town where the incident took place. To assess this, we conducted an additional analysis limiting our focus to the deadliest third of the mass shootings in our sample, including only shootings where at least 10 victims were killed. Results are displayed in *SI Appendix*, Fig. S7. Estimated effects are less precise because of the small sample but do show that the magnitude of the estimated impact of these more extreme events is larger than in the full sample of mass shootings; however, the duration of the impact is similar. For example, respondents interviewed throughout the state in the day after a mass shooting with at least 10 fatalities were 10 percentage points more likely to report feeling sadness a lot in the day prior. Yet, the effects on sadness still faded within a week.

The Effects of Mass Shootings by Political Affiliation. To examine the effects of a mass shooting by political affiliation, we replicated the main analyses at the city/town level, using stratified samples of respondents who self-identified as Republican or Democrat, respectively. These analyses make comparisons among individuals of the same political affiliation who live within the same town or city where a mass shooting has occurred. Although we do not have sufficient statistical power to formally test the difference in effects by political affiliation, Fig. 4 points to a weaker emotional response to mass shootings among Republican respondents in comparison to Democrat respondents.

Mass shootings have striking immediate effects on the emotions of Democrat respondents living near the event. Exposure to a mass shooting in the day prior to the interview led to a 49-percentage-point increase in probability of feeling sadness a lot yesterday, a 25-percentage-point increase in the probability of feeling angry, a 21-percentage-point decrease in the probability of feeling happy, and a 61-percentage-point decrease in the probability of smiling/laughing. Yet, the effect of mass shootings still diminishes within days of the event, with the exception of smiling/laughing. Among Republican respondents living near a mass shooting, the same pattern of results is present, but the effect sizes are typically smaller in magnitude than for Democrats. Exposure to a local mass shooting substantially decreases the probability of smiling/laughing a lot for around a week following the event, but it does not have any statistically significant effect on feelings of sadness, anger, or happiness.

Discussion

The analysis leads to four conclusions. First, mass shootings have a substantial impact on the emotions of adults in the cities and towns in which they occur. In the days after a mass shooting, the percentage of local respondents who report feeling sadness and anger rises sharply, while the percentage reporting feeling happiness, or smiling and laughing a lot, plummets. One important feature of the Gallup US Poll is that questions were not asked about feelings toward shootings but, rather, were asked about all emotions felt in the day prior to the interview. The fact that the impact of mass shootings is so clearly visible indicates that these incidents weigh heavily on the minds of respondents, leading many to report emotions of anger and sadness that are otherwise rarely reported in the Gallup US Poll.

Second, the impact of mass shootings on daily emotions is short-lived. The continuous survey of daily emotions allows one to track the duration of the impact and shows that the salience of mass shootings fades very quickly. With most outcomes, the impact of mass shootings (even the most extreme incidents) is close to zero within roughly 1 wk of the event. The short duration of the impact could be interpreted to mean that mass shootings are not

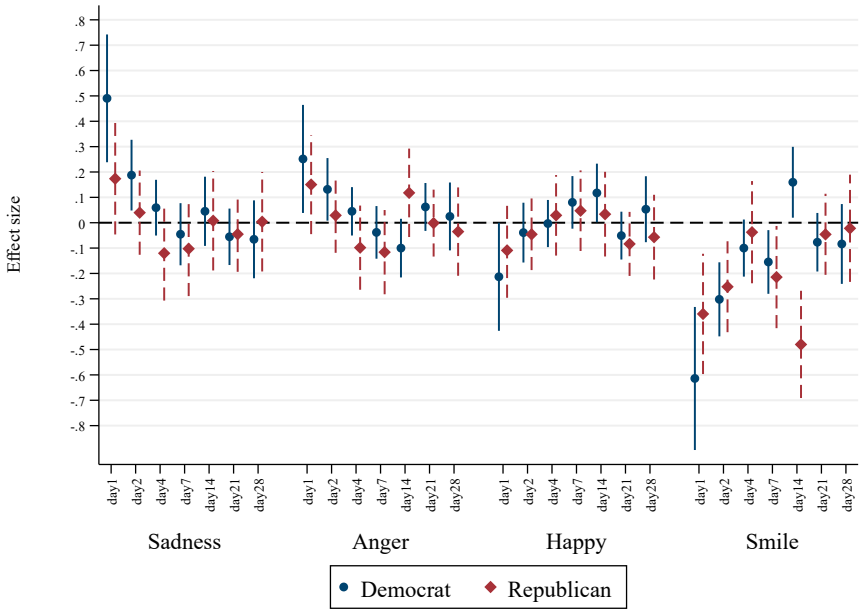

Fig. 4. The effect of mass shootings on daily emotions by self-identified political affiliation. Bars are 90% CIs.

particularly salient events in the lives of most Americans, or it might signify that most respondents move on quickly from any public event that does not affect individuals or their direct networks and friends.

To provide a point of comparison, we examined the impact on emotions of other salient cultural and political events: the National Football League Super Bowl and the presidential elections in 2008, 2012, and 2016 (*SI Appendix*, Figs. S9 and S10). The impact of the Super Bowl on respondents' emotions varied depending on whether the respondent lived in the city/state of the Super Bowl winner or loser, and in the case of presidential elections, the impact depended on whether the respondent supported the election winner or loser. However, the overarching pattern was a strong immediate impact on respondents' emotions that typically faded within 1 to 2 wk of the event. The implication is that public events can have a substantial impact on the emotions of respondents throughout an entire area or the nation as a whole, but the impact of all such events is typically transitory. Even the most horrific mass shootings produce a similar response.

The third conclusion from the analysis is that the geographic scope of the impact is limited. Analyses were conducted at the level of zip codes, towns/cities, and states where mass shootings occurred. We did not report analyses at the zip code level because of small sample sizes within zip codes, but the pattern of results shows that shootings have an enormous impact on the emotions of individuals living in the same zip codes and the same cities and towns where shootings occur. Analyses that widen the scope to the state show considerably smaller impacts, indicating that mass shootings have their greatest impact at a very local level. This finding is consistent with recent evidence on the importance of spatial proximity to mass shootings to shifts in public support for gun control (8, 9).

However, the geographic pattern of results shown in Figs. 2 and 3 does not mean that the impact of mass shootings is not felt across a wider area. The magnitude of the impact of mass shootings at the state level, while much smaller than the impact at the local level, was still comparable to the impact on emotions of some of the most salient cultural and political events in American life (*SI Appendix*, Figs. S9 and S10). Moreover, when we focused on the most extreme incidents, defined as those where at least 10 people are killed, we found that mass shootings led to much stronger effects at the state level. This evidence is valuable for understanding how mass shootings may create "policy windows" on gun laws at the state level (7).

Fourth, the impact of mass shootings on emotions varied by political party affiliation. Respondents who identified as Democrats showed a strong change in emotions in the aftermath of mass shootings. Respondents who identified as Republicans showed a more muted response for all outcomes except laughing/smiling a lot. Gun policy is one of the most partisan topics in US politics (9, 10), and the findings from our analysis provide suggestive evidence that the immediate emotional responses to nearby mass shootings are at least partially filtered through one's political identity. This finding is consistent with research showing distinct belief systems between Republicans and Democrats regarding causes of and solutions to mass shootings in the context of extreme political polarization (11, 12).

Taken together, the results provide evidence of the tangible impact that mass shootings have on the emotions of people over space and time. Media coverage in the aftermath of shootings frequently documents expressions of sadness and anger that are shared by anyone asked to respond to the tragedy. Our analysis provides a different kind of analysis, allowing for a day-to-day portrait of how this type of horrific incident changes the emotional state of residents throughout an area. It provides clear quantitative evidence documenting a process of collective grieving after a tragedy but reveals that these incidents are not forefront in respondents' minds unless they live close to the incident and only a short time has passed.

Beyond providing a quantitative portrait of how collective grief plays out over space and time, the results from the analysis are valuable for understanding why these incidents have had less of an impact on social policy than proponents of gun control might hope. Prior research has shown that mass shootings lead to an increase in the number of gun-related bills introduced at the state level, but the impact on state legislation passed looks very different in legislatures controlled by Republicans versus Democrats (7). Whereas mass shootings are associated with increases in legislation that loosens gun restrictions in Republican-controlled legislatures, mass shootings are not associated with any changes in gun legislation that is passed in Democrat-controlled legislatures.

There are multiple possible ways to interpret this finding. One interpretation is that the emotional impact of mass shootings is overwhelmed by policy preferences of voters and the political forces that influence the policy-making process in ways that have aligned to emphasize gun rights over gun control. A second interpretation is that the impact of mass shootings on emotions is widely shared but leads to distinct ideas about policy responses among Democrats and Republicans. Research on public opinion in the aftermath of mass shootings shows that preferences for gun policy shifted toward more restrictive gun laws among Democrat voters and looser gun laws among Republican voters who lived near the event (8, 9). However, this research found little impact of mass shooting on preferences for gun policy beyond the local community (8).

A third interpretation, which we consider most plausible, is that the emotional impact of mass shootings may be a powerful force in political and public discourse on gun policy, but the effect of mass shootings on emotions is typically not sustained nor spread widely enough to affect state legislative outcomes. In the days after a mass shooting, it has become common to hear politicians offer their "thoughts and prayers" to victims, their families, and the residents of places where incidents occur. These expressions of empathy, sadness, and anger come in the small window of time during which the emotional impact of mass shootings is strongest. It is plausible that as the emotional response to an incident subsides, emotion becomes less of a factor in the process leading from introduction to passage of state legislation.

Additional research with complementary sources of data would be valuable for reconciling these possible interpretations. The Gallup US Daily survey is unique because the survey allows for an analysis of how mass shootings affect the emotions of a national sample without priming respondents to think about the events. This data source is particularly useful for analyzing the degree to which mass shootings are forefront on the minds of respondents without a prompt, but it would also be valuable for future research to estimate the emotional response to being primed to think about specific mass shootings over time. It is possible that the impact of mass shootings on individuals daily emotions is short-lived but that the initial emotional response returns when individuals are primed to think about an incident. Future research analyzing the impact of priming respondents to think about mass shootings would be a useful complement to this article.

Although we have emphasized the limited scope and timeframe of the estimated effect of mass shootings, we conclude by returning to the central finding of the analysis: Mass shootings have a clear, substantial impact on the emotions of respondents throughout the city or town in which they occur, and the deadliest mass shootings have a large effect that is visible across the state. The magnitude of the impact is comparable to or larger than some of the most salient cultural and political events in American society. While the emotional response of Republican

respondents was smaller, it is also true that the overarching pattern of findings for respondents who identified as Republicans was very similar to that found for Democrats. This finding suggests that these incidents may provide a "policy window" to make bipartisan appeals that draw on the emotional responses to mass shootings in the effort to enact policy change. If policy reform efforts are to draw on collective emotional responses to these events, however, our findings suggest that they will have the greatest chance of success if they emerge at the local level in the immediate aftermath of a mass shooting.

Materials and Methods

Defining and Measuring Mass Shootings. We use three databases that track mass shooting incidents from 2008 to 2016: the FBI Active Shooter Study (AS), the Stanford Mass Shootings of America (MSA) data project, and the Violence Project (VP). Based on police/FBI records and open sources, AS identified incidents where one or more individual is actively engaged in killing or attempting to kill people in a populated area with apparent randomness of victims (13). MSA collected via online media reports incidents with three or more shooting victims (not necessarily fatalities) and without identifiable association with gang, drug, or organized crime (14). VP included incidents where four or more victims were murdered with firearms in a public location(s) within one event, and the murders are not related to any other criminal activity or commonplace circumstance (15). Given that the number of fatalities is the strongest predictor of media coverage (16) and the most common definition of mass shooting in the literature (17, 18), we restrict our analysis to incidents with at least four fatalities. AS included 37 such incidents from 2008 to 2016, VP included 43, and SP included 55. Of the 66 incidents defined as a mass shooting by any of the three organizations collecting the data, only 31 were identified as a mass shooting in all three. Another 7 were identified in two datasets, and 28 were only identified in one dataset. The main analysis is based on the 31 incidents present in all three sources.

Gallup US Daily Data. Data on daily emotions come from the Gallup US Daily survey. Gallup US Daily, which began in 2008, is a daily national survey of opinions, attitudes, daily emotional state, and well-being with a national sample of American adults ages 18 and older. Interviews were conducted using random digit dial methods with landline and cellphones. The sample size was ∼1,000 American adults per day from 2008 to 2012 and ∼500 American adults per day from 2013 to 2016, with surveys conducted every day except major holidays. Weights were developed to adjust for the probability of selection into the survey, nonresponse, and phone usage.

Respondents were asked about their feelings and emotional expressions in the day prior to the interview, with questions such as, "Did you experience sadness during a lot of the day yesterday?" and "Did you smile or laugh a lot yesterday?" Outcome measures are derived from responses to questions asking about sadness, anger, happiness, and smiling/laughing during the day prior to the interview. Questions about sadness, happiness, and smiling/laughing were asked every year from 2008 to 2016, while the question about anger was not asked in 2014 or 2015.

In addition to the outcomes, we measured the sociodemographic characteristics of respondents available in each year of the survey as control variables, including whether the respondent identified as White, whether the respondent had any college education, whether the respondent was married, respondent gender, respondent age, and whether the respondent has no kids in the household, one kid, or at least two kids in the household. To examine heterogeneity in the effects by political affiliation, we measure whether a respondent self-identified as Republican, Democrat, or other.

Statistical Analysis. We estimate the following equation to capture the temporal impact of a mass shooting incident on respondent emotion in the day prior to the interview over a 4-wk period after the incident:

$$Emotion_{ipt} = \beta_0 + \beta_1 After_d + \beta_2 Before_after_d + \beta_3 X_i + \gamma_t + \sigma_p + \epsilon_{ipt}, \quad [1]$$

where $Emotion_{ipt}$ denotes a vector of dummy variables measuring whether the respondent, i, interviewed at time, t, in location, p, experienced sadness, anger, happiness, or smiling/laughing a lot yesterday. $After_d$ is an indicator that equals one for respondents living in the same location as the shooting and interviewed during day d − 1 to day d + 1 (or, if day is equal to 1, during the first day) after the incident. $Before_after_d$ is an indicator that equals one for respondents living in the same location as the shooting and interviewed during the 4 wk before the incident as well as respondents with $After_d$ equal to one. X_i denotes a vector of sociodemographic characteristics of the respondent. γ_t denotes a vector of the year, month, and day-of-the-week fixed effects. σ_p denotes the fixed effects of the location where the shooting occurred. The locations are cities/towns for the city-level analysis and states for the state-level analysis. ϵ_{ipt} is the error term. The estimated effect of the mass shooting β_1 is identified by comparing individuals interviewed at different periods of time after the shooting to individuals in the same location who were interviewed in the 4 wk before the incident, with controls for respondent sociodemographic characteristics as well as the day of the week, the month of the year, and the year in which the interview was conducted.* Alternative specifications are outlined in *SI Appendix*, section 1C. To examine the effect of mass shootings by political affiliation, we estimate the same equation with respondents who identified themselves as Republicans and Democrats, respectively.

Data Availability. All replication materials have been deposited in Harvard Dataverse (https://doi.org/10.7910/DVN/GFS8I4).

*We do not adjust SEs for clustering by location. This decision is based on guidance from Abadie et al., who argue that one should not adjust the SE for clustering in a fixed-effects context when there is neither clustering in the treatment assignment or clustering in the sampling (19). In our case, the sampling method is random digit dial and there is no clustering in being interviewed after versus before a mass shooting.

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