

**Critical Review Form  
Therapy**

[Olson EJ, Hoofnagle M, Kaufman EJ, Schwab CW, Reilly PM, Seamon MJ. American firearm homicides: The impact of your neighbors. J Trauma Acute Care Surg. 2019 May;86\(5\):797-802.](#)

**Objectives:** “to evaluate the association between less restrictive state firearm legislation and firearm fatality rates in neighboring states with the most restrictive firearm legislation”...and...”to examine the effects of firearm legislation and firearm trafficking on firearm homicide rates for both white and black Americans—the two most common populations in the United States.” (p. 797)

**Methods:** This retrospective, observational study was conducted using data available for the years 2011 to 2015. Each state’s [Brady Campaign to Prevent Gun Violence](#) score was obtained for 2011, 2013, and 2015. These scores were then standardized to a score between 0 and 1, and these were averaged over the three time periods for each state. Firearm fatal injury data for each state were then obtained from the [Centers for Disease Control and Prevention Web-based injury statistics query](#) from 2011 to 2015 to identify rates of firearm deaths, firearm homicides, black firearm homicides, and white firearm homicides. Finally, [firearm tracing data from the bureau of alcohol, tobacco, and firearms \(ATF\) database](#) were used to identify the percentage of firearms recovered from any crime scene and traced to outside of each individual state.

For the top 10 most restrictive firearm legislation states (based on Brady Score), their Brady Scores were averaged with the scores of their neighboring states to create a novel score that accounts for surrounding states’ legislation (Border Adjustment Score). Forearm fatality and homicide rates were calculated for each Brady Score quintile based on total deaths and total population. Additionally, for each Brady Score quintile, the percent of guns traced to outside the state was calculated, then used to obtain a correlation coefficient.

From 2011 to 2015 there were 169,396 total firearm fatalities and 57,885 firearm homicides. Of these, 33,158 homicides involved black victims and 23,158 involved white victims. The median Standardized Brady Score for all states was 0.16 (0 representing least restrictive and 1 the most restrictive) with a mean of 0.27.

Guide		Comments
I.	Are the results valid?	
A.	Did experimental and control groups begin the study with a similar prognosis?	
1.	Were patients randomized?	No. This was a purely observational study conducted using data obtained from multiple databases from 2011

		to 2015. The primary exposure of interest in this study was the Border Adjustment Score; it is not clear if the formula for this score was defined <i>a priori</i> , or was derived with knowledge of the data and potential impact of the formula.
2.	Was allocation concealed? In other words, was it possible to subvert the randomization process to ensure that a patient would be “randomized” to a particular group?	N/A.
3.	Were patients analyzed in the groups to which they were randomized?	Patients were analyzed based solely on which state they were in when their firearm fatality occurred.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	There were no treatment and control groups, per se. Rather, the authors sought (primarily) to compare firearm fatality and homicide rates based on the Border Adjustment Score of the state in which the incident occurred. There may be additional, independent risk factors associated with each state that could affect the risk of a firearm fatality/homicide that would impact the results of this study.
<b>B.</b>	<b>Did experimental and control groups retain a similar prognosis after the study started?</b>	
1.	Were patients aware of group allocation?	N/A. This was an observational study in which patients were analyzed purely based on the state in which the event occurred. Blinding was neither possible nor relevant to the analysis.
2.	Were clinicians aware of group allocation?	N/A. See above.
3.	Were outcome assessors aware of group allocation?	N/A. See above.
4.	Was follow-up complete?	Presumably yes. While there was no specific follow-up in this study, all patients suffering a fatality due to a firearm injury in the US should be captured by the CDC database.
<b>II.</b>	<b>What are the results ?</b>	
1.	How large was the treatment effect?	<ul style="list-style-type: none"> <li>• Overall, 49% of firearms were traced to states outside the state in which they were recovered. <ul style="list-style-type: none"> <li>○ In the most restrictive firearm legislation quintile, 65% of firearms traced to another state.</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>○ In the least restrictive firearm legislation quintile, 44% of firearms traced to another state.</li> <li>○ When using the Border Adjustment Score ranking, there was no difference in percent of firearms traced to another state between the least and most restrictive quintiles.</li> <li>● There was a strong correlation comparing firearm fatalities between Standardized Brady Score quintiles (<math>R^2 = 0.96</math>). <ul style="list-style-type: none"> <li>○ This correlation was weaker for overall firearm homicide rates and white firearm homicide rates, and there was no correlation with black firearm homicide rates.</li> </ul> </li> <li>● The correlation between firearm fatality was stronger when looking at the Border Adjustment Score, but was poor when looking at black firearm homicide rates: <ul style="list-style-type: none"> <li>○ <math>R^2 = 0.9878</math> for all firearm mortality.</li> <li>○ <math>R^2 = 0.8935</math> for all firearm homicide</li> <li>○ <math>R^2 = 0.3939</math> for black firearm homicide</li> <li>○ <math>R^2 = 0.9025</math> for white firearm homicide</li> </ul> </li> <li>● After controlling for state demographics and violent crime rates, multivariable analysis found no correlation between Brady Score and all homicides (IRR 0.98, 95% CI 0.95 to 1.01) but a lower incidence of firearm homicide in states with more restrictive legislation in the Border Adjustment Score model (IRR 0.57, 95% CI 0.54 to 0.60).</li> <li>● When analyzed by race, both Standardized Brady Score (IRR, 0.61; 95% CI 0.58, 0.64), and Border Adjustment Score (IRR, 0.31; 95% CI 0.28, 0.35) correlated with decreased white firearm homicide rates as legislation became more restrictive.</li> <li>● For black Americans, more restrictive state firearm legislation correlated with higher firearm homicide rates (IRR, 1.26; 95% CI, 1.20–1.30) when using the Standardized Brady Score but lower firearm homicide rates (IRR, 0.79; 95% CI, 0.73–0.85) when using the Border Adjustment Score.</li> </ul>
2.	How precise was the estimate of the treatment effect?	See above.
<b>III.</b>	<b>How can I apply the results to patient care?</b>	
1.	Were the study patients similar to my patient?	Not really. As Missouri was in neither the highest nor lowest quintile of Brady Scores or Border Adjustment Scores, its data was not used in most of the

		calculations. In theory, based on correlations with both scores, our firearm mortality rates should be somewhere in the middle for the country as a whole.
2.	Were all clinically important outcomes considered?	No. This study's outcomes were limited to firearm mortality and homicide rates, and did not address all firearm injuries or costs associated with firearm use (medical or societal).
3.	Are the likely treatment benefits worth the potential harm and costs?	Uncertain. While there did seem to be some association between Brady Scores and Border Adjustment Scores, these correlations were not entirely consistent. It would be imprudent, based solely on these data, to recommend more restrictive firearm legislation as a means to reducing firearm mortality or homicide.

**Limitations:**

- 1. It is not clear if the formula for the Border Adjustment Score (the primary exposure of interest) was defined *a priori*, or if this was derived with knowledge of the data and potential impact of the formula.**
- 2. No attempt was made to control for potential confounders, i.e. state-based risk factors for firearm mortality/homicide that are independent of state legislation such as [median age, racial composition, geography](#).**
- 3. This study was not able to look at outcomes beyond mortality and homicide rates; specifically, it was not able to look at overall firearm-related injury rates or costs associated with firearm use.**

**Bottom Line:**

**This retrospective, epidemiologic study found that the correlation between state firearm legislation and firearm fatality rates and homicide rates improved after adjusting for neighboring state firearm legislation. When looking at states with the most restrictive gun legislation, 65% of recovered firearms were found to have originated from a different state, compared to 49% nationally.**