The Impact of a Diagnosis of Mental Illness on Mass Shooting Severity: Evidence from Propensity Score Matching

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BACKGROUND

- A mental illness diagnosis can **instill hope**, **reduce self-blame,** and provide an explanation for lifelong challenges, positively shaping self-concept and identity (Connell et al., 2012; Gellini & Marczac, 2023).
- On the other hand, a diagnosis can lead to **self-imposed stigmas,** negatively impacting personality, behavior, and performance (Franz et al., 2023; Rüsch et al., 2005).
- **Ethical and practical barriers** have limited experimental research on the effects of receiving a diagnosis.
- **Causal inference techniques** allow for reliable causal estimates in the absence of experimental methods.

METHODS

- Data from ***The Violence Project's Most Comprehensive Mass Shooter Database*** (n = 196).
- 3 **Multiple Imputation** (MI) methods to handle missing data (logistic regression, predictive mean matching, and random forest).
- 2 **Propensity Score Matching** (PSM) methods to obtain causal estimates of a mental illness diagnosis on total victims.
  - 20 variables were used to estimate the propensity scores, including almost all variables that predict a diagnosis identified in the literature.

Figure 1. Simplified directed acyclic graph (DAG) with selection bias confounders for diagnosis and shooter severity.

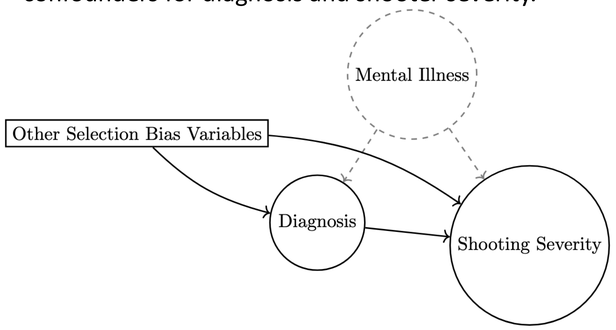

Table 1. Number of observations for variables with missing data.

Variable	Missing (n, %)
Lower-class SES	63 (32%)
College	53 (27%)
Blue collar job	32 (16%)
Community involvement	30 (15%)
Employed	11 (6%)
Had children	9 (5%)
Divorced	8 (4%)

Table 2. Descriptive statistics: mental illness diagnosis, total victims, and other related variables.

Variable	Yes	No
Diagnosis	92	104
Male	191	5
White	103	93
Divorced	32	156
Trauma	65	131

Variable	Mean	SD
Total Victims	13.7	13.7
Age	33.8	12.5

Variables not included: Employment Status, Employment Type, Social Economic Status, Community Involvement, Childhood Abuse, Suicidality, Substance Abuse, Counseling, Criminal Record, Entrance into College, Children, Violent Games, History of Violence

Figure 2. Propensity Score Overlap: Caliper vs. Nearest Neighbor Distributions

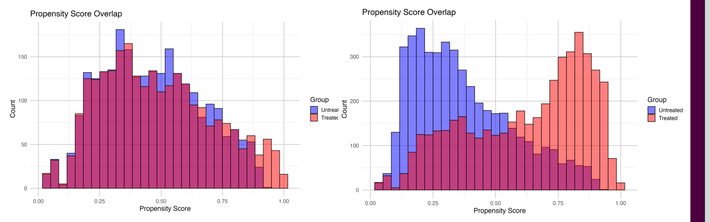

Table 3. Regression results: 6 models for estimating causal effects of diagnosis on total victims

	Dependent variable: Total victims in a mass shooting					
	Nearest Neighbor Matching			Caliper Matching		
	Logreg	RF	PMM	Logreg	RF	PMM
Mental Illness Diagnosis	2.756	2.772	2.764	-1.495	-1.664	-1.319
	(2.071)	(2.071)	(2.071)	(2.881)	(3.121)	(3.047)
	[0.185]	[0.182]	[0.184]	[0.606]	[0.596]	[0.667]
Constant	12.711	12.695	12.703	13.994	14.336	14.299
	(1.465)	(1.465)	(1.465)	(2.026)	(2.146)	(2.099)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Average Observations	184	184	184	104.16	104.64	105.04
R^2	0.010	0.010	0.010	0.007	0.008	0.006
Adjusted R^2	0.004	0.004	0.004	-0.003	-0.002	-0.004
F Statistic	1.773 (df = 1; 182)	1.793 (df = 1; 182)	1.783 (df = 1; 182)	0.732 (df = 1; 102)	0.815 (df = 1; 102)	0.597 (df = 1; 100)

Note: Standard errors in parentheses; p-values in brackets.
*Significance levels: *p<0.1; **p<0.05; ***p<0.01*

RESULTS

- **No statistically significant result** from diagnosis of mental illness on mass shooting severity in all six models.
- Caliper matching had better covariate balance but limited sample size. Nearest neighbor matching had larger sample size but greater standardized mean differences between groups.
- **Low R^2 values** indicate **minimal explanation** of variance by diagnosis alone.

CONCLUSION

- The study suggests that a mental illness **diagnosis does not predict violent event severity.**
- **Further studies** are needed to explore the positive and negative **impacts of diagnoses beyond case-by-case reports.**
- **Causal inference techniques** could be **valuable** in psychological research where experiments are infeasible.

Scan QR code above to access the paper, which includes supplemental material.

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