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SUICIDE AND ORGAN DONORS: SPILLOVER EFFECTS OF MENTAL HEALTH INSURANCE MANDATES

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ABSTRACT

This paper considers the effect of mental health insurance mandates on the supply of cadaveric donors. We find that enacting a mental health mandate decreases the count of organ donors from suicides and results are driven by female donors. Using a number of empirical specifications, we calculate that the mental health parity laws are responsible for an approximately 0.52% decrease in cadaveric donors. Additional regression results show that the mandates are not related to other types of organ donations, ruling out the possibility that the mandates are related to an overall trend in the supply of organ donations. The findings suggest that future policies aimed at reducing suicide in a large and significant way can potentially increase the inefficiency that currently exists in the organ donor market. Copyright © 2014 John Wiley & Sons, Ltd.

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1. INTRODUCTION

Several studies have shown that economic and public policies are related to mental health outcomes. In particular, increases in state spending on public health (Minoiu and Andrés, 2008) and public assistance (Flavin and Radcliffe, 2009) are correlated with reductions in state suicide rates. Since 1994, nearly all states in the USA have enacted mental health mandates aimed at increasing access to mental health care. The Mental Health Parity and Addiction Equity Act has created a federal mandate starting in 2014. These mandates are shown to increase substance abuse treatment (Dave and Mukerjee, 2011) and reduce suicide (Lang, 2013). Suicide is positively correlated with psychiatric disorders (Mann et al., 2005), and the reduction in suicide may represent an overall improvement in mental health.

The reduction in suicides caused by these mandates may also reduce the number of organs donated. Suicide deaths tend to provide fewer damaged organs than other causes of death (Figueiredo et al., 2007) and account for approximately 9.7% of organ donations. If fluctuations in the suicide rate impact the supply of organ donors in a significant way, enacting mental health mandates may reduce the supply of organ donations. This paper explores whether suicide reducing mental health laws decrease the supply of organ donors.

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1The seminal work on suicide by Durkheim (1897) finds a strong relationship between financial crises and suicide rates in 19th century Europe. Henry and Short (1954) find that suicide rates in higher status groups reacted strongly to business cycle fluctuations. See Lester and Yang (1997) for a detailed discussion of historical suicide research.

2There is a strand of literature in economics that studies the decision-making process of suicidal individuals in a theoretical context. See Chen et al. (2012) for a thorough review of recent suicide work.
Between 1994 and 2009, every state but Idaho enacted a mental health parity law aimed at providing health insurance coverage for mental health treatment. Although there is variation between state laws, a natural grouping can be made based on attributes of the mandates. The strongest mandates require health insurance packages to cover or offer mental health care coverage at the same terms and conditions as physical health care. Weaker laws require mental health care coverage, but the coinsurance rates and number of days covered do not need to be at parity. We use state-level variation in adoption year of the required mental health parity laws to explore how increased access to mental health care impacts organ donations.

Currently, over 100,000 individuals are on the US waiting list for an organ transplant. As advocates attempt to correct the market inefficiency by increasing the supply of donors, policies that save and extend lives may offset increases in the cadaveric donation rate. State motorcycle helmet laws, for example, decrease fatal motorcycle accidents and also decrease the supply of cadaveric organ donors (Dickert-Conlin et al., 2011). Our paper aims to increase understanding of the organ donation market and aid policy makers attempting to eliminate the inefficiencies in the market.

2. DATA AND EMPIRICAL RESULTS

A number of data sources are used to isolate the relationship between mental health parity laws, suicide rates, and organ donations. The Organ Procurement Transportation Network reports the count of cadaveric donors originating from suicide by sex and state for 1995–2010. Suicide data are from CDC WISQARS and are merged with state-level demographic variables from the Behavioral Risk Factor Surveillance System and the Association of Religion Data Archives: United States Decennial survey. A state is considered a parity state in a particular year if it has enacted a law requiring mental health care to be provided or offered at parity with physical health care. If a state enacts a law in the middle of the year, it is not considered a parity state until the following year.

The average US suicide rate is 11.3 suicides per 100,000 people. Men account for approximately 80% of all US suicides and use firearms in 55% of suicides, while women attempt suicide three times as often as men (Krug, 2002) and use poison more often than any other method (CDC, 2010).

Descriptive statistics of suicide and suicide donors are found in Table I. Male suicides account for 80% of all suicides and 81% of all suicide donors. On average, 1.7% of suicides become organ donors. This result is consistent across gender, but female suicide donors have a larger variance in their donation rate. The average number of suicide donors for women is 2.83 and for men is 11.03.

The following regression isolates the relationship between donors, suicide rates, and mental health parity laws:

$$\ln \lambda_{it} = \gamma \text{Mandate}_{it-1} + \beta X_{it} + \theta_i + \pi_t + \epsilon_{it}. \tag{1}$$

In Equation (1), $\ln \lambda_{it}$ is the natural log of the suicide or donor rate per 100,000 in state $i$ at time $t$. The variable of interest is Mandate, which is equal to one if a state has enacted a mental health parity mandate in the previous year and zero otherwise. The matrix $X_{it}$ contains state-level control variables: unemployment rate, percent White, percent female, percent married, income/capita, percent Medicaid coverage, percent Medicare coverage, percent private insurance, percent military insurance, percent catholic, state population, and population age grouping. State and year fixed effects are captured by $\theta_i$ and $\pi_t$, respectively. Table II reports the mean, standard deviation, and range of the variables.

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5See Lang (2013) for a detailed description of the specific state laws.
6Facebook recently urged members to add their organ donor status (Richtel and Sack, NY Times, May 1, 2012).
7CDC: www.cdc.gov/ncipc/wisqars
8We use seven age groups: 0–17, 18–24, 25–34, 34–35, 45–54, 55–64, and +64 years.
The parameter of interest, $\gamma$, represents the percent change in suicides or donors associated with an adoption of the mental health parity mandate. The first column of Table III reports the regression results from Equation (1). Enacting a mental health mandate decreases the suicide rate by approximately 2.5%, and the coefficient estimate is not impacted by covariates, consistent with previous findings (Lang, 2013).

The suicide data are reported as count values and may be non-normally distributed causing ordinary least squares (OLS) estimates to be biased. We adopt a fixed effects Poisson regression to account for the count
nature, and the estimated coefficients are consistent even if the underlying data generating process is not Poisson (Gourieroux, et al., 1984). We account for potential overdispersion of the count data by estimating robust standard errors clustered by state (Cameron and Trivedi, 2005).\(^7\)

\(^7\)Similar estimates are obtained using the quasi-maximum likelihood estimator with robust standard errors suggested by Wooldridge (1999).
We define the conditional suicide donor mean, $\lambda_{it}$, of the fixed effects Poisson model as
\[
\ln \lambda_{it} = \gamma \text{Mandate}_{it-1} + \beta X_{it} + \ln(\text{state population}_{it}) + \theta_i + \pi_t.
\]  

(2)

We restrict the coefficient of the state population variable to unity, which converts the count model into a rate model $\ln[\lambda_{it}/\text{state population}_{it}]$. However, state population is allowed to affect the rate by including $\ln(\text{population})$ in the $X$ as well.\(^8\)

Column (2) of Table III shows the results of the Poisson specification for the suicide rate. The mandate is associated with a significant 3.84% decrease in the suicide rate without covariates and a 2.89% decrease with covariates included. The results in columns (1) and (2) suggest that enacting a mental health parity mandate is associated with a significant decrease in state suicide rates.

Almost 10% of organ donations are from suicide deaths. Therefore, it is possible that the decrease in suicides from mental health mandates will reduce cadaveric organ donors. Columns (3) and (4) of Table III begin to address this relationship. Column (3) reports OLS regression results where the dependent variable is the suicide donor rate. When a mandate is enacted, donor rates decrease, but the effect is only marginally significant when covariates are included. The coefficient estimates become insignificant using the Poisson specification, suggesting that mandates do not significantly impact the overall organ donation rate.

To better understand the relationship between parity mandates, suicide, and donation rates, Table IV presents the coefficient estimate of the parity mandate for men and women. Each cell represents a unique regression for a specific sex. Standard errors are reported in parentheses and the $R^2$ is reported in italics. All regressions include all covariates reported in Table III including state and year fixed effects.

$R^2$ and McFadden $R^2$ are reported in italics. Robust standard errors clustered at the state level are reported in parentheses. All regressions include all covariates reported in Table III including state and year fixed effects.

<table>
<thead>
<tr>
<th>Sex</th>
<th>ln(Suicide rate)</th>
<th>ln(Suicide donors rate)</th>
<th>ln(Suicide donors/suicides)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) OLS</td>
<td>(2) Poisson FE</td>
<td>(3) OLS</td>
</tr>
<tr>
<td>Male</td>
<td>$-0.0292^{**}$</td>
<td>$-0.0303^{***}$</td>
<td>$-0.0414$</td>
</tr>
<tr>
<td></td>
<td>$(0.0123)$</td>
<td>$(0.0104)$</td>
<td>$(0.0486)$</td>
</tr>
<tr>
<td>Female</td>
<td>$-0.0117$</td>
<td>$-0.0382^{*}$</td>
<td>$-0.178^{*}$</td>
</tr>
<tr>
<td></td>
<td>$(0.0231)$</td>
<td>$(0.0223)$</td>
<td>$(0.0895)$</td>
</tr>
</tbody>
</table>

\(^8\)This restriction only affects the coefficient of population in the regression and allows easy comparison with the OLS estimates.
0.017, if no selection issue existed, the mandate is expected to decrease the number of female donors by 0.003 per 100,000. Instead, column (4) shows that female suicide donors decrease by approximately 0.023 per 100,000 when evaluated at the mean. The suicide rate for women decreased after the mandate, but the donations per suicide fell by more.

Because female donor rates are impacted by mental health parity laws, but men are not, it is possible that the mandate has affected the production function of organ donors from suicide by gender. The mandate can reduce the number of suicide donors through two potential pathways: (1) by preventing the suicide or (2) by damaging the organs of a potential donor.\footnote{Some mental health medications can damage kidney and liver functions (see National Institute of Mental Health, ‘Mental Health Medications’, US Dept. of Health and Human Services \url{http://www.nimh.nih.gov/health/publications/mental-health-medications/nimh-mental-health-medications.pdf})}

If the mandate decreases suicides by more than it decreases suicide donors, then the ratio of suicide donors to suicides will increase.

Columns (5) and (6) of Table IV report the mandate coefficients when the ratio of suicide donors to suicides is the dependent variable. In the Poisson specification, the mandate decreases the ratio of suicide donors to suicide for women significantly, but insignificantly increases the ratio for men. Consistent with the findings in columns (2) and (4), the marginal female suicide donor is more sensitive to the mandate change than the marginal male donor.\footnote{Not reported in the tables, we find the mandate decreases the probability of a suicide donor from drug intoxication by $-0.14$ ($p$-value = 0.07). These estimates are found using the full set of controls and robust standard errors clustered by state. We do not find a statistically significant relationship for gunshot wounds and the mandate. We are unable to disaggregate this effect by gender with the publicly available data.}

Overall, the results in Table IV suggest there is a disproportionate share of female organ donors that are impacted by the mental health mandate.

We consider a falsification test to rule out the potential that the mandate is correlated with other modes of organ donations. The count of organ donors from motor vehicle accidents is used as a test group. In addition to the previous controls, we include motorcycle helmet laws and seat belt laws as controls. The estimates are reported in Table V. The effect of the mandate is close to zero and not significant at conventional levels.\footnote{In unreported regressions (available upon request), we use a negative binomial specification to directly account for overdispersion, but the results are qualitatively unchanged.}

The aforementioned results are consistent with previous work showing that state-level mental health parity mandates are related to decreases in the suicide rate. The mandates do not have an observable effect on the overall suicide donation rate, but the mandate decreases female suicide donor rates significantly. Male suicide donor rates are insignificantly affected by the mandates.

\begin{table}[!h]
\centering
\caption{the effect of mental health mandates on MVA donor rates, by sex}
\begin{tabular}{llll}
\hline
\textbf{ln(MVA donor rate)} & \multicolumn{3}{c}{\textbf{Poisson FE}} \\
\hline
\textbf{Variables} & \textbf{All} & \textbf{Male} & \textbf{Female} \\
\hline
Mandate & $-0.0391$ & $-0.0517$ & $0.00101$ \\
& (0.0354) & (0.0393) & (0.0460) \\
Universal helmet law & $-0.0423$ & $-0.0668^{**}$ & $0.000242$ \\
& (0.0331) & (0.0321) & (0.0522) \\
Partial helmet law & $-0.0455$ & $-0.107^{**}$ & $0.0902^{*}$ \\
& (0.0399) & (0.0481) & (0.0464) \\
Seat belt law secondary & 0.182*** & 0.252*** & 0.127* \\
& (0.0474) & (0.0631) & (0.0688) \\
Seat belt law primary & 0.197*** & 0.250*** & 0.160** \\
& (0.0378) & (0.0507) & (0.0657) \\
Observations & 603 & 603 & 603 \\
McFadden $R^2$ & 0.768 & 0.708 & 0.577 \\
\hline
\end{tabular}
\end{table}

Robust standard errors clustered at the state level are reported in parentheses. All regressions include all covariates reported in Table III including state and year fixed effects.

MVA, motor vehicle accident; FE, fixed effects.

\(*p < 0.01, **p < 0.05, ^{*}p < 0.1.*

3. DISCUSSION AND CONCLUSION

In the past two decades, most states enacted mandates that increase access to mental health care and improve mental health outcomes. These measures have now been adopted at the federal level as well. Because a significant fraction of organ donations come from suicide deaths, mental health laws can potentially affect the supply of organ donors. We explore the relationship between mental health parity laws and organ donors and find that parity mandates are associated with modest decreases in female suicide donors, but not male suicide donors. The results suggest that women who benefit from mental health intervention differ from those who do not. Why this difference manifests itself in the organ donation market is unable to be answered currently, however, is a relevant topic for future research.

Mental health mandates decrease female suicide donors by 28.4%, but the impact on the overall organ donor supply is less, because women account for 19% of suicide donors and 10% of organ donations are from suicides. These point estimates suggest that mental health laws decrease the organ supply by approximately 0.52%; Dickert-Conlin et al. (2011) find that motorcycle helmet laws decrease the supply by 0.98%. Mental health parity laws have a small, but significant, impact on the overall organ supply. As policy makers and advocates continue to push for policies aimed specifically at suicide prevention, the supply of organ donors will have to increase through other sources in order to keep the inefficiency of the organ market from growing.

REFERENCES


