

Do Mental Health Insurance Laws Reduce Crime?

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Abstract

In this paper, I examine the effect of state laws requiring insurers to provide some level of mental health insurance on the rates of violent and property crime. While previous studies have considered the relationship between mental health and crime and the impact of insurance mandates on health outcomes, this paper is the first to connect state mandates to crime rates. Using a difference-in-differences approach with state-level data from 1990 to 2004, I find that insurance mandates significantly lower crime rates. Specifically, states that require insurers to offer mental health insurance plans with the same coverage as physical health insurance plans observe an 8 to 10 percent reduction in violent crime relative to states with no mental health insurance mandate. However, the results are sensitive to the classification of mandates and could be driven by different time trends across states before the passing of insurance mandates.

Keywords: Mental Health Insurance, Mental Health Laws, Crime Rates

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1 Introduction

Mental illness is a serious problem in the United States. In 2011, the Department of Health and Human Services estimated that one in five adults experienced a mental health issue, one in ten adolescents experienced a period of depression, and one in twenty Americans lived with a serious mental illness such as schizophrenia, bipolar disorder, or major depression.¹ In addition to reducing mental well-being, it is believed that severe mental illness could lead to other adverse consequences such as unemployment, substance abuse, and increased likelihood to commit crime.² Indeed, there is a well-established literature on the economic and demographic consequences of mental illness: it has been showed to significantly reduce employment opportunities (Ettner *et al.* (1997)), reduce earnings, affect the ability to get marry or stay married, and lower fertility rates (Bartel and Taubman (1986)).

Nonetheless, an examination of the literature in psychology, psychiatry, and economics reveals that the relationship between mental illness (or, more generally, mental health) and crime is quite complex. On one hand, the proportion of crime committed by persons with mental illness is low³ and mental illness is not among the most significant predictors of individuals' criminal behavior,⁴ yet there seems to be much stigma attached to the notion that it often influences crime decisions.⁵ On the other hand, recent evidences point to a causal effect of mental illness on criminal activities, with depression being the most common measure of mental illness.⁶

¹<http://www.mentalhealth.gov/basics/myths-facts> - Department of Health and Human Services.

²The National Alliance for Mental Illness asserts that besides these conditions, mental illness could also lead to unnecessary disability, homelessness, and suicide and that the annual economic cost of untreated mental illness could be as much as \$100 billion. http://www2.nami.org/Content/NavigationMenu/Inform_Yourself/About_Mental_Illness/About_Mental_Illness.htm

³Corrigan and Watson (2005), using data from the National Comorbidity Survey, put this rate at about 2%.

⁴Peterson *et al.* (2014) conduct extensive interviews with criminal offenders and conclude that only 4% of all crimes in their sample is directly related to psychosis, 3% to depression, and 10% related to bipolar disorder.

⁵See Corrigan (2006) for a review of stigmas that are commonly associated with mental illness.

⁶There is ample correlational evidence on the relationship between depression and criminal behavior (see, for example, Malmquist (1997) on depression and homicidal violence or Swartz and Lurigio (2007) on depression and arrest), but Anderson *et al.* (2015) are able to identify a causal link between youth depression and future engagement in property crimes using data from the National Longitudinal Study of Adolescent Health.

In this paper, I shed light on the impact of one particular aspect of mental health on criminal activities; specifically, I investigate the effect of states' mental health insurance laws on violent and property crime rates. The public focus on mental health problems during the late 1990s and early 2000s (especially after highly-publicized tragedies) has resulted in significant changes to federal and state laws governing the provision of mental health insurance.⁷ On the federal level, both the Mental Health Parity Act (MHPA) of 1996 and the Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008 require some form of parity in the way insurers provide mental health insurance versus physical health insurance. After the passage of MHPA, many states also enacted their own legislation mandating the level of benefits and the conditions that insurers have to cover under their mental health insurance plans. By the end of 2004, all but six states had put some restrictions on how insurers can provide mental health insurance, with a majority of them requiring the coverage of mental health insurance to be at parity with its counterpart for physical health insurance.⁸ My identification strategy uses the variation in the timing of states' law changes to estimate their impact on crime rates.

There is a robust literature on the relationship between mental health and crime; furthermore, the use of mental health insurance mandates as a source of variation to study the effect of mental health insurance on a number of health outcomes has been receiving increased attention in economics. To my knowledge, however, this is the first paper that attempts to connect mental health insurance laws to crime rates, thus bridging the gap between these two established areas of research.

Using a difference-in-differences approach with state-level data from 1990 to 2004, I find evidence that mental health insurance mandates reduce violent crime. Specifically, states that require insurers to offer mental health insurance with coverage that is at parity with

⁷Most of the law changes only apply to private insurers that provide health plans to mid-size or large groups (50 employees or more); smaller group plans are often exempted from these laws.

⁸This paper uses Lang's (2013) interpretation of state mandates on health insurance since it is an established methodology. There are other interpretations that differ slightly from Lang's (2013). See, for example, the Center for Mental Health Services (2007) or the National Alliance on Mental Illness (2009).

physical health insurance coverage experience a large and significant reduction in violent crime relative to those without such conditions. The results are robust to the inclusion of additional controls to account for various factors that could be influencing crime rates. Similar to previous research examining mental health and crime, I find almost no effect of mental health legislation on property crime rate.

Nonetheless, my results are sensitive to the different classifications of states' mental health laws, and I cannot rule out the possibility that there is a downward trend in violent crime before the passage of mental health mandates among the states that witness the largest declines in crime post-mandate. In spite of these challenges, the findings in this paper should still be of considerable benefit to policy makers who seek to understand the impact of mental health insurance on economic outcomes. I also urge researchers using state insurance mandates as a source of variation to pay careful attention to the classification of said mandates, as it could greatly alter their results.

These findings also have important public policy implications in light of recent changes to the provision and delivery of health care in the U.S. The passage of the Affordable Care Act (ACA) in 2010 has increased the number of people with insurance coverage and, it stands to reason, the utilization of mental health care.⁹ Indeed, Garfield *et al.* (2011) estimate that 3.7 million individuals with severe mental illness will gain coverage once the ACA is completely implemented in 2019. Evidence on the effectiveness of mental health insurance in alleviating crime rates should provide additional justification for the increasing provision of health insurance among the general population, a major objective of the ACA.

The rest of the paper proceeds as follows. In Section 2, I provide a brief introduction to federal and state mandates on mental health insurance and review two strands of relevant literature: one on the relationship between mental health and crime and the other on the impact of states' insurance mandates on various economic outcomes. Section 3 describes

⁹The ACA requires insurance plans available in the Marketplace to cover mental health and substance abuse services. Furthermore, insurers cannot deny coverage on the basis of preexisting conditions in mental health or substance abuses. <http://www.healthcare.gov/coverage/mental-health-substance-abuse-coverage>

the data sources and presents some summary statistics, while Section 4 focuses on the main empirical results . In Section 5, I discuss some implications of these results and conclude.

2 Background

2.1 The relationship between mental health and crime

Choe *et al.* (2008) provide a review of the psychiatry literature on the association between the perpetration of violence, violent victimization, and severe mental illness. They conclude that although the rate of crime committed by people with mental illness is low, the rates of violent perpetration and victimization are significantly higher among people with severe mental illness relative to the general population.¹⁰ This is consistent with a large body of literature in economics that finds a negative relationship between mental wellness and crime, with the strongest impact often observed during adolescent years. Using data from Colorado, Cuellar *et al.* (2004) find that mental health and substance abuse treatment significantly reduce crime detention for young adults. Along the same lines, Fletcher and Wolfe (2009) observe that having Attention Deficit Hyperactivity Disorder (ADHD) during childhood increases the tendency to engage in a number of criminal behaviors while Anderson *et al.* (2015) find a causal impact of youth depression on the likelihood of committing property crimes during adulthood,¹¹ both using panel data from the National Longitudinal Study of Adolescent Health. Wen *et al.* (2014) document a decrease in crime rate corresponding to an increase in substance use disorder treatment using county-level data from 2001 to 2008

Several studies attempt to pin down the mechanisms linking mental health problems and crime. Frank and McGuire (2010) propose that the reduction in crime based on an

¹⁰Research using data from the Epidemiologic Catchmen Area suggests that the rate of perpetration is about 7% to 8% for the population of people with mental illness and 2% for the general population (Swanson *et al.*, 1990), while data from the National Crime Victimization survey suggest that the rate of victimization is about 25% in the former group and 3% in the latter group (Teplin *et al.*, 2009).

¹¹Interestingly, and contrary to what one might expect, they find no impact of youth depression on violent and drug-related crimes, making theirs one of the few studies where the effect of mental illness manifests itself in the form of an increase in property crime rate.

increase in mental wellness could be due to an increase in the utilization of mental health treatment. They then examine the effect of increasing mental health treatment in the criminal justice system and find that, somewhat unexpectedly, the gains from such increase are small. In contrast, Jofre-Bonet and Sindelar (2001) consider the impact of drug treatment as a crime fighting tool and conclude that treatment aiming at reducing substance abuse has a significant effect in decreasing crime rates.¹² Marcotte and Markowitz (2011) suggest that recent advances in psychiatric drugs and their rapid diffusion could play an important role in reducing violent crime.

Finally, even though a majority of this literature focuses on the impact of mental health on crime, the other direction of influence (from crime to mental wellness) could also be of interest. There are some evidences that individuals living in areas with higher crime rates experience worse mental health outcomes (Ross (2000), Stafford *et al.* (2007)), but the causality of the impact is unclear. Using panel data from Australia, Cornaglia *et al.* (2014) find that violent crimes significantly reduce mental wellness for both victims and nonvictims alike, and the society-wide impact of an additional victim could be as big as 80 times more than the direct impact on the victim.¹³

2.2 Mental health mandates and their impact

2.2.1 An introduction to federal and state mandates on mental health insurance

In 1974, California became the first state to enact a mental health insurance mandate, which called for insurers to provide a minimum level of benefits for mental health insurance. During the late 1980s and early 1990s, several states passed similar mandates, among them were Hawaii in 1988, Colorado and Florida in 1992, and South Carolina in 1995.¹⁴ MHPA was the first federal law that put restrictions on mental health insurance coverage, prohibiting

¹²Their sample consists of individuals from the inner-city with low incomes and histories of drug abuse, so the representativeness of the sample is poor.

¹³Property crime perpetration and victimization show no such effects in their study.

¹⁴See Lang (2013), table A1.

insurers from offering mental health insurance plans with annual or lifetime benefits less than those of physical health insurance plans, again, should they choose to offer mental health insurance. It did not put restrictions on doctor visits or hospital stays, and it did not preempt existing state laws on mental health insurance.¹⁵

After the passage of MHPA, a number of states started to reform mental health insurance coverage. In 1998, seven states enacted mental health insurance legislation; this number dropped slightly to six states in 1999 but rose to 14 states in 2000.¹⁶ States continued to change their mental health insurance requirements up until the mid 2000s. By the end of 2004, only six states maintained no restriction on the provision of mental health insurance.¹⁷

In this paper, I adopt the convention set forth in Lang (2013) and group these mandates into four categories:

- Parity laws: insurers in states with parity laws are required to provide both mental and physical health insurance, and the coverage for mental health insurance has to be at parity with the coverage for physical health insurance.
- Mandated offering laws: insurers in these states are required to offer mental health insurance with coverage at parity with physical health insurance, but consumers can choose whether to purchase such a plan.
- Minimum mandated benefit (MMB) laws: insurers are required to offer mental health insurance, but state mandates only place a minimum level of benefits on these plans, which is less than that of physical health insurance plans.
- Mandated if offered laws: insurers are not required to offer mental health insurance; should they choose to do so, the coverage for mental health is regulated in manners that are different across states.¹⁸

¹⁵It also did not require states to enact it for it to take effect; however, most states started passing their own mandates soon after. See Center for Mental Illness Services (2007), p. 14.

¹⁶See Lang (2013), Figure 1.

¹⁷See Table 1 for a complete list of state mandates.

¹⁸This regulated coverage could be either at parity with or less than that of physical health insurance coverage.

Lang (2013) calls the states that fall into the first two categories “access to parity” states since residents of these states have access to mental health insurance with coverage that is at parity with physical health insurance’s. In contrast, states that fall into the last two categories are “no access to parity” states. The analysis in subsequent sections uses this classification, supplemented with results when all four categories are included. For reference, Table 1 reproduces Lang’s (2013) breakdown of state insurance mandates according to the four categories above.¹⁹

2.2.2 The effect of state mandates on various outcomes

How effective are insurance mandates in increasing access and utilization of mental health care? Sipe *et al.* (2015) review the literature on mental health insurance mandates at both the federal and state levels and note that the evidence seems to be in favor of increases in access and utilization of mental health care, with large effects from comprehensive parity legislation. At the state level, Busch and Barry (2008) find that these effects are more pronounced among individuals from small- to mid-size firms²⁰ and individuals with low income, while Dave and Mukerjee (2011) observe that states mandating at-parity mental health coverage see an increase in substance-abuse treatment admissions. On the cost side, Rosenbach *et al.* (2009) examine the impact of a mental health mandate in California and find that increases in utilization did not lead to big increases in cost due to the use of managed care as a cost-controlling measure.

Among the first to document the impact of mental health laws in the economics literature, Klick and Markowitz (2006) find that health insurance mandates are largely ineffective in reducing states’ suicide rates. Lang (2013) attributes this finding to the fact that the data in Klick and Markowitz (2006) do not cover periods after 2000, when a majority of states

¹⁹It is worth noting that several states switched their mandates from “minimum mandated benefit laws” to “parity laws” during the period examined in this study (1990-2004). These states are California, Colorado, Hawaii, Illinois, Kansas, and Massachusetts.

²⁰This is due to the fact that large firms are often exempted from state mandates due to the Employee Retirement Income Security Act.

passed new mental health insurance legislation. Using more extensive state-level data from 1990 to 2004, Lang (2013) finds that having access to mental health insurance with at-parity coverage reduces the rate of suicide by a statistically significant 4%. Cseh (2008) studies whether the passage of parity mandates lead to adverse labor market consequences such as employers passing the costs onto employees or refusing to provide insurance and finds no such result. Andersen (2014) hypothesizes that this non-result could be because the effect of parity mandates on labor market outcomes depends on the level of mental distress. After accounting for this heterogeneity, parity mandates are showed to have adverse effects on non-distressed individuals; however, they do lead to favorable outcomes for workers with mental distress and they are, at worst, slightly welfare-reducing.

This paper builds upon the recent advancement in the literature utilizing state insurance mandates. I exploit the variation in the timing of states' legislation changes to study the effect of insurance mandates on two novel outcomes, property and violent crime rates. The results will provide additional evidence of the link between mental health and crime, which is relevant to policy makers for two reasons. First, as described in the previous section, the impact of mental health insurance on crime rates takes on greater importance after the passage of the ACA in 2010. Moreover, for states looking to adopt the federal MHPAEA as guidelines to improve mental health insurance coverage, any spillover effect of insurance mandates on crime rates should be among meaningful factors that ought to be considered.

3 Data

State-level data from 1990 to 2004²¹ are obtained from a number of sources. The main dependent variables of interest, property and violent crime rates per 100,000 residents, come from the Uniform Crime Report (UCR), a database published by the Federal Bureau of In-

²¹To be consistent with the established methodology in Lang (2013), I use the same time periods as his paper. My data extend beyond 2004, but there is a strong possibility that the results will be confounding state-level impact with federal-level impact driven by the passage of MHPAEA. Therefore, observations beyond 2004 are dropped from the sample. Total observations: 51 states (including D.C.) \times 15 years = 765.

investigation. The UCR classifies violent crime into four categories: murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault. Similarly, property crime is classified into three categories: burglary, larceny theft, and motor vehicle theft. The analysis in the next section examines the impact of insurance mandates on overall violent and property crime rates as well as their impact on the various types of violent and property crimes.

I also use several time-varying state characteristics as control variables. To account for the effect of economic conditions on crime rates, the unemployment rate and median household income are included in the regression. Percentages of black and white residents serve as demographic controls,²² while number of prisoner per 1,000 residents accounts for trends in states' criminal justice systems. Data on the unemployment rate are from the Bureau of Labor Statistics, median household income and percentages of black and white residents are from the Census Bureau, and prisoner per 1,000 residents is from the Bureau of Justice Statistics.²³ Table 2 presents summary statistics for all variables.

To motivate the regression analysis in Section 4, Table 3 presents difference-in-differences (DD) estimates of the impact of insurance mandates on violent crime rate (panel A) and property crime rate (panel B). Since states passed mental health insurance legislation at different points in time, it is not possible to conduct DD-style mean comparisons. Instead, I follow Lang's (2013) methodology and define the treatment group as states with "access to parity" mandates (e.g. parity laws or mandated offering laws) and the control group as states with "no access to parity" mandates (e.g. MMB laws, mandated if offered laws, or no law). This allows for comparisons of outcomes using a rather general classification of state insurance laws.²⁴ The pre-treatment period is from 1990 to 1997 while the post-treatment

²²One might question why percentage of Hispanic residents is not included. My demographic data come from the Census, with data between 1990-1999 obtained from the postcensal estimates while data from 2000-2004 are from the intercensal estimates. The classification of Hispanic differs between these two Census waves; therefore, I include only percentages of black and white residents as demographic controls.

²³Data on the median household income and prisoner per 1,000 residents are obtained through the Rand Corporation's State Statistics program.

²⁴Another way to conduct mean comparisons is to define the treatment group as each of the four mandate categories and the control group as the no-law states. However, we will then have four DD estimates, and

period is from 1998 to 2004. Lang (2013) explains why it is reasonable to classify treatment periods in such manner: the majority of states that enacted “access to parity” laws did so after 1997²⁵ and thus treatment status is positive for most of the treatment group following that year. Furthermore, dividing the sample into pre- and post-1997 periods allows for the number of observations in the control and treatment groups to be distributed as evenly as possible. There are two main disadvantages of this method, nonetheless: first, I am grouping together states that passed reform laws in different years, so there will be a loss of varying power in estimating the treatment impact. Additionally, the identified impact could be picking up confounding effects from the implementation of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, a major policy reform in the United States. To that extent, regression analysis in the next section can help account for these factors.

We can observe in Table 3 that both violent and property crime rates fall during the post-treatment periods for the control and treatment groups. Crime rates are also lower for the treatment group in both periods. The DD estimates point to only a modest reduction in the property crime rate (about 130 per 100,000 residents) and an increase in the violent crime rate (about 40 per 100,000 residents) for states with “access to parity” laws, though both are statistically insignificant.

it is not clear which one is *the* DD estimate of interest.
²⁵22 states, versus 7 states pre-1997.

4 Regression Analysis

To further analyze the effect of insurance mandates on crime rates, I turn to regression analysis and estimate the following generalized DD models:

$$Crime_{it} = \beta_1 + \beta_2 access_{it} + \beta_3 no_access_{it} + X_{it}\Theta + \gamma_i + \delta_t + \epsilon_{it} \quad (1)$$

$$Crime_{it} = \beta_1 + \beta_2 parity_{it} + \beta_3 mandated_offering_{it} + \beta_4 mmb_{it} + \beta_5 mandated_if_offered_{it} + X_{it}\Theta + \gamma_i + \delta_t + \epsilon_{it} \quad (2)$$

In both models, $Crime_{it}$ is the crime rate (violent or property) of state i in year t , X_{it} is a vector of time-varying state characteristics specified in the previous section, while γ_i and δ_t are state and year fixed effects, respectively. In the first model, $access_{it}$ is a dummy variable that equals 1 if state i has a mandate that requires insurers to provide access to at-parity mental health insurance (e.g. parity law or mandated offering law) in year t and 0 otherwise. Similarly, no_access_{it} is a dummy variable that equals 1 if state i has either a MMB law or mandated if offered law in year t and 0 otherwise.²⁶ In the second model, $parity_{it}$, $mandated_offering_{it}$, mmb_{it} , and $mandated_if_offered_{it}$ are dummy variables indicating each of the four mandate categories.

The main difference between the two models is in how each estimates the effect of mandates on crime rates. The first model measures the impact of passing either an “access to parity” mandate or a “no access to parity” mandate relative to passing no mandate at all (the omitted group), while the second model measures the impact of passing any of the four mandates relative to passing no mandate.

All regressions are weighted by states’ population, and standard errors are clustered at the state level to account for any within-state serial correlation (Bertrand *et al.* (2004)). To

²⁶This is slightly different than the DD estimate in section 3, where “no access to parity” states also include states with no mandate.

rule out any timing effect of new legislation, states that pass a mandate during the middle of the year will have that state-year observation deleted from the sample, though results are insensitive to the inclusion of these observations.

4.1 The impact of mandates on violent and property crimes

Table 4 presents estimation results of Model 1 in Panel A and model 2 in Panel B. In this table, each column within a panel is a separate regression. The dependent variable in the first three columns is the violent crime rate, while the last three columns present results with property crime rate as the dependent variable. Column (1) in Panel A, which only controls for state and year fixed effects, shows that passing an “access to parity” mandate does not result in any noticeable change in the violent crime rate, while passing a “no access to parity” mandate brings about a sizable increase in the violent crime rate of about 80 incidents per 100,000 residents, which is statistically significant at the 5% level. The inclusion of additional time-varying controls in column (2)²⁷ does not alter the results qualitatively, although the effect of passing a “no access to parity” mandate becomes smaller in magnitude (60 incidents). Column (3) uses the same specification as column (2), except the dependent variable is now the log of violent crime rate. Results indicate that “access to parity” states see an insignificant decrease of 3% in violent crime while “no access to parity” states see a marginally significant increase of 6%. Overall, columns (1) to (3) in Panel A suggest that mental health insurance mandates, as classified by their ability to provide at-parity coverage with physical health insurance, are either ineffective or negligibly detrimental in reducing violent crime. Columns (4) to (6) examine the impact of parity mandates on property crime rate. Using the most comprehensive specification with both state and year fixed effects and time-varying controls, I find an insignificant impact on the level (column (5)) and log (column (6)) of property crime rate from having any mandate. Column (6) indicates that states with “access to parity” mandates observe a 6% decrease in property crime relative

²⁷The slight decrease in sample size from column (1) to column (2) is due to the fact that there is no information on prison population in DC after 2000.

to states without any mandate and “no access to parity” states observe a 1% increase in property crime, with both effects being statistically insignificant.

Instead of classifying mental health insurance mandates into “access to parity” laws or “no access to parity” laws, the specifications in Panel B of Table 4 use all four mandate categories as the independent variables. Looking at column (2) and column (3) in this panel, we can see that the null results in Panel A actually mask two striking effects: mandated offering states witness very large and significant decreases in violent crime rate (about 120 incidents, or 18%) relative to those that do not pass a mandate, while MMB states see significant changes in the opposite direction (an increase of about 80 incidents, or 10%). Though not quite as substantial, the impact of mandated offering laws and mandated if offered laws on property crimes is also worth mentioning. Column (6) in panel B suggests that mandated offering laws decrease property crime by roughly 15% while mandated if offered laws increase property crime by 7%, with the effect of mandated offering laws being significant at the 5% level. The next section is devoted to investigate possible factors that could be driving these surprising results

Since the UCR data offer a detailed breakdown of violent and property crimes, it is informative to examine the impact of insurance mandates on different types of violent and property crimes. Results from these regressions are showed in Table 5 and Table 6. Analogous to Table 4, each column within a panel is a separate regression. The dependent variables are logged for ease of interpretation, and all specifications include state and time fixed effects and time-varying controls. The first column in each table reproduces the baseline results in column (3) and column (6) of Table 4.

The results from these tables further illustrate the sensitivity of the estimation to mandate classification. In Table 5, classifying mandates into “access to parity” and “no access to parity” laws leads to estimation of null effects, whereas including a full set of mandate categories results in significant estimates of the impact of mandated offering and MMB laws. While mandated offering laws significantly decrease all types of violent crime (with a

remarkable reduction of 22% in robbery), the effect of MMB laws is primarily due to their impact in increasing assaults. Similarly, we can see in Table 6 that the impact of mandated offering laws on property crime is spread out among all types of property crimes, with the strongest decrease observed in motor vehicle theft.

4.2 Robustness checks

The most salient aspect of the analysis so far is the substantial impact of mandated offering laws, and to a lesser extent, MMB laws, on crime rates. In this section, I put forth several hypotheses and robustness checks that aim to explain these drastic results. These are shown in Table 7, the first column of which reproduces the baseline estimates of the impact of insurance mandates on violent crime (Panel A) and property crime (Panel B). Similar to previous tables, the dependent variables are logged and state and year fixed effects as well as time-varying controls are included in all regressions.

The omission of the transitioning periods during which MMB states become parity states could play a role in driving the results. Previously, this group is pooled with the group that passes parity laws directly. To account for this, column (2) of Table 7 includes a transition indicator variable that turns on and stays on after a state has moved from having MMB law to parity law. This inclusion has little overall impact: the coefficients stay virtually the same save for a slight decrease in magnitude and significance of the MMB variable in Panel A and a loss of significance for the impact of mandated if offered laws in Panel B.

The results could also be influenced by other crime trends that are not picked up by the prisoner population control or year fixed effects. Column (3) adds a “crack index”, as calculated in Fryer *et al.* (2013), as an additional control to account for the impact of the crack cocaine epidemic during the 1990s on crime rates.²⁸ Since the data is only available through 2000, there is a significant loss of observations with this inclusion. Nonetheless, I still

²⁸This index is calculated based on a number of indirect proxies, such as cocaine arrests, cocaine-related emergency room visits, cocaine-induced drug deaths, crack mentions in newspapers, and DEA drug busts. Higher index values indicate worse crack cocaine problems.

obtain the same qualitative results: mandated offering states continue to observe significant decreases in both violent and property crime rates (though the size of the impact on violent crime decreases from 0.20 to 0.13) and MMB states observe an increase in violent crime. Alternatively, column (4) includes region-by-year fixed effects to control for crime trends in each Census region. Surprisingly, this brings about no meaningful change in the results.

Another possible channel of influence is through outliers. Table 1 indicates that among states with mandated offering laws, New York seems to be an outlier with significantly more crimes than the rest of the group. Indeed, during the periods in the sample, the violent crime rate in New York greatly exceeds that of the other three mandated offering states.²⁹ California also stands out among the states with MMB laws for similar reasons. Column (5) of Table 7 tests for the extent to which the estimates are driven by these two states by measuring the impact of the mandate categories on crime rates with New York and California excluded from the sample.

There is strong evidence that the sizable estimates obtained in previous specifications are partly due to outliers. A comparison of column (1) and column (5) in Panel A reveals that the effect of mandated offering laws on violent crime decreases by more than half once New York and California observations are dropped (from -0.18 to -0.08, now significant only at the 10% level). Moreover, the impact of having MMB laws shrinks to 0.06 from 0.10 and is no longer significant. The results in Panel B also show that the strong impact of mandated offering laws on property crime is almost completely due to the inclusion of New York and California; once these observations are dropped there no longer seems to be any effect of mandated offerings (or any other law) on property crime.

For completeness, column (6) of Table 7 combines all the robustness checks into one regression. Except for the mild impact of parity laws on property crime, none of the other mandates show any effect on any type of crime rate. This is most likely due to the loss

²⁹The violent crime rate in New York between 1990 to 2004 is 764.03 per 100,000 residents, while the violent crime rates for Alabama, Georgia, and Utah are 591.92, 599.53, and 281.72, respectively. Interestingly, New York is also the state with the *largest* reduction in property crime rates during this period.

of power associated with the use of the “crack index” control and the exclusion of New York and California observations. Overall, the estimates in Table 7 suggest that outliers are instrumental in driving the significant results in the previous section.

Still, a decrease of almost 8% in violent crime from having mandated offering laws (sans outliers) is noteworthy. One reason for the strong impact of mandated offering laws could be due to the misclassification of state laws. As Klick and Markowitz (2006) point out, it is difficult to classify health insurance mandates in a consistent manner across all states since legislative statutes often contain different languages. Even when the wording of a mandate is the same, there is a possibility that states’ judicial or regulatory agencies may differ in their interpretations and thus the implementation of such mandate will be different accordingly. Therefore, it is possible that the effect of mandated offering laws on violent crime is strongly attributable to misspecification. Table 8 presents suggestive evidence why this is unlikely. In this table, I calculate the change in violent crime rate before and after a mental health insurance mandate is passed for each state while keeping the organization of mandates from Table 1 intact. A ranking of states with the largest to smallest declines in violent crime after the passage of a mandate reveals that three of the four mandated offering states rank in the top ten states with the biggest declines, with Utah being the sole exception. Moreover, a simple within-group average confirms that the mandated offering states witness the largest decline in violent crime post-mandate, a reduction of 242.17 incidents. While it is possible that misclassification of mandates is indeed the driving factor behind the regression results, the calculations in Table 8 cast doubts on the validity of this hypothesis.³⁰

One might still question whether there are confounding factors that could explain the decrease in violent crime for states with mandated offering laws. For example, if mandated offering states are already on a downward trajectory with respect to violent crime relative

³⁰It is also worth pointing out the discrepancy in the impact of MMB laws on violent crime in table 8 and table 4: in table 8, MMB states see the second highest decline in violent crime rate while table 4 suggests that states with MMB laws actually witness an *increase* in violent crime. This is most likely due to the classification of the six states that switched from MMB laws to parity laws as parity states for simplification.

to states with no mandate prior to the passage of mental health insurance legislation, the regression would overestimate the impact of these laws. Table 9 addresses this issue by conducting an event study analysis in which the log of violent crime rate is regressed on dummy variables indicating periods before and after a mandated offering law is passed. In this regression, only observations from the mandated offering group are used. The omitted independent variable is the dummy for the year that a mandate is passed, and the coefficient for each of the included dummies measure the percentage change in violent crime rate in a specific period relative to the passage year. If there is indeed a downward trend in violent crime, we should observe positive and significant coefficient estimates for the dummies indicating years before reform and negative and significant coefficients estimate for the years after reform. In table 9, I find a pattern that seems to fit this hypothesis; however, all coefficients are not statistically significant, most likely due to the small sample size (4 states \times 15 years = 60 observations). Alternatively, in a separate regression, I regress the log of violent crime rate on a linear time trend (with state fixed effects) and find that the coefficient on the linear time trend is negative and significant at the 5% level (estimate: -0.06, $p = 0.015$). Thus, I cannot rule out the possibility that the strong results observed previously are partially driven by preexisting downward trends in crime among mandated offering states.

5 Conclusion

Recent years have witnessed substantial changes in the provision of mental health insurance in the United States, with the Affordable Care Act estimated to expand mental health and substance abuse benefits for more than 60 million Americans.³¹ In light of such dramatic changes, an examination of the impact of mental health insurance on various outcomes is essential in helping policy makers assess the importance of mental wellness and the need for increasing mental health insurance among the general population. Previous studies have considered the effect of states' mental health insurance laws on outcomes such as service

³¹<http://www.mentalhealth.gov/get-help/health-insurance> - Department of Health and Human Services.

utilization, adverse labor market consequence, and suicide tendency. Nonetheless, to the best of my knowledge, the role of insurance laws in reducing crime rates has not been addressed in the literature.

This paper investigates the impact of mental health insurance mandates on violent and property crime rates using state-level panel data from 1990-2004. I find evidence that states requiring insurers to offer mental health insurance with coverage at parity with physical health insurance observe a sizable reduction in the violent crime rate. This reduction decreases in magnitude, but not significance, after accounting for the impact of outliers. Thus, I provide new evidence on the relationship between mental health and crime and on the importance of mental health insurance in influencing criminal behavior.

However, there are a number of challenges to my estimation strategy. First, the results are considerably sensitive to the classification of mandates: grouping mandates into “access to parity” and “no access to parity” laws leads to estimation of null effects, whereas including a full set of mandate categories results in large and significant estimates. This finding has important implications for future studies that seek to utilize state mandates as a source of variation. Second, I am unable to rule out the possibility that there is a declining trend in violent crime among the states that are most impacted by passing mental health legislation. Third, without further data on mental health treatment or changes in pharmaceutical trends, I cannot speak to the channels through which insurance mandates help decrease violent crime rate.

In spite of these challenges, the effect of mental health insurance on economic outcomes could prove a fruitful area for future research. For example, the role of mental health insurance in reducing domestic violence is an interesting question with great policy import. Similarly, the precise mechanisms behind the impact of mental health insurance mandates is a research agenda that merits further consideration.

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Table 2: Summary statistics

Variable	Mean	Std. deviation	Min	Max
Violent Crime	516.84	340.46	65.4	2,921.80
Murder & non-negligent manslaughter	6.94	8.38	0.20	80.6
Forcible rape	37.20	13.36	14.90	98.60
Robbery	148.90	149.40	6.40	1,266.40
Aggravated assault	323.81	198.36	34.10	1,557.60
Property Crime	4,134.63	1,170.05	1,931.60	9,512.10
Burglary	875.81	320.96	307.90	2,170.60
Larceny theft	2,824.62	736.10	1,413.10	5,833.80
Motor vehicle theft	434.20	255.87	94.50	1839.90
Unemployment rate	5.26	1.45	2.30	11.30
Median household income	37,188.09	7,471.02	19,475.00	57,363.00
Percentage of white residents	0.80	0.15	0.25	0.98
Percentage of black residents	0.11	0.12	0.003	0.66
Prisoner per 1,000 residents	3.15	1.81	0.59	15.95

Notes: full sample of 51 states in 15 years (1990-2004). N = 765. Numbers rounded to the nearest hundredth. Crime rates are per 100,000 residents.

Table 3: Diff-in-diff estimates of the impact of insurance mandates on crime rates

Panel A: Violent crime rate			
State mandate	Periods		Difference between periods
	1990 - 1997	1998 - 2004	
Access to parity states	519.63 (19.68)	402.77 (14.02)	-116.85 (24.79)
No access to parity states	657.62 (36.12)	502.11 (23.84)	-155.52 (44.59)
Difference between mandate types	-138.00 (38.72)	- 99.33 (26.27)	
Diff-in-diff estimate	38.67 (48.15)		
Panel B: Property crime rate			
State mandate	Periods		Difference between periods
	1990 - 1997	1998 - 2004	
Access to parity states	4,379.30 (67.94)	3442.46 (61.89)	-936.84 (92.88)
No access to parity states	4,766.33 (102.27)	3,956.48 (75.15)	-809.85 (129.99)
Difference between mandate types	-387.03 (118.39)	-514.02 (96.61)	
Diff-in-diff estimate	-126.99 (155.52)		

Notes: Standard errors are in parentheses. Access to parity states include states with parity laws or mandated offering laws. No access to parity states include states with minimum mandated benefit laws, mandated if offered laws, or no law. Six states that switched from minimum mandated benefit laws to parity laws are classified as access to parity states.

Table 4: The effect of mental health insurance on crime rates

Variable	Violent crime			Property crime		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: access vs. no access to parity						
Access to parity	0.26 (44.09)	0.56 (44.68)	-0.02 (0.05)	-151.25 (221.83)	-89.01 (226.86)	-0.06 (0.05)
No Access to parity	82.35** (34.98)	60.15** (28.71)	0.06* (0.04)	164.52 (129.45)	135.93 (145.39)	0.01 (0.03)
Panel B: all mandates						
Parity	50.69 (30.32)	57.22* (30.90)	0.05 (0.03)	-49.60 (222.03)	45.88 (213.03)	-0.02 (0.04)
Mandated offering	-118.66 (74.47)	-121.74** (48.07)	-0.18*** (0.05)	-377.03 (289.00)	-364.90 (271.92)	-0.15** (0.07)
MMB	109.07** (41.57)	83.18*** (27.87)	0.10*** (0.03)	169.66 (149.81)	135.90 (154.44)	0.01 (0.04)
Mandated if offered	67.42** (33.35)	36.90 (30.33)	-0.02 (0.04)	377.23 (273.19)	315.61 (219.23)	0.07* (0.04)
N	752	748	748	752	748	748
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
Log dependent variable	No	No	Yes	No	No	Yes

Notes: Each column in a panel is a separate regression. *, **, and *** indicate significance at the 10%, 5%, and 1% level. All regressions are weighted by states' populations. Standard errors in parentheses. Standard errors are clustered at the state level. Controls include unemployment rate, median household income, percentages of black and white residents, and prisoner per 1,000 residents. Data from 1990 - 2004. In both panels, the reference group is states with no mental health insurance mandate. States that pass a legislation mid-year will have that state-year legislation dropped from the sample.

Table 5: The effect of mental health insurance on violent crime

Variable	Violent crime (1)	Murder & Manslaughter (2)	Rape (3)	Robbery (4)	Assault (5)
Panel A: access vs. no access to parity					
Access to parity	-0.02 (0.05)	-0.04 (0.06)	-0.03 (0.04)	-0.06 (0.08)	0.02 (0.04)
No Access to parity	0.06* (0.04)	0.02 (0.04)	0.01 (0.03)	0.04 (0.06)	0.08** (0.04)
Panel B: all mandates					
Parity	0.05 (0.03)	0.04 (0.04)	-0.01 (0.04)	0.02 (0.04)	0.07* (0.04)
Mandated offering	-0.18*** (0.05)	-0.19* (0.11)	-0.09* (0.05)	-0.22* (0.12)	-0.11** (0.05)
MMB	0.10*** (0.03)	0.03 (0.04)	0.03 (0.04)	0.04 (0.06)	0.14*** (0.04)
Mandated if offered	-0.02 (0.04)	0.08 (0.06)	-0.03 (0.04)	0.13 (0.09)	-0.08 (0.06)
N	748	748	748	748	748

Notes: Each column in a panel is a separate regression. *, **, and *** indicate significance at the 10%, 5%, and 1% level. All regressions are weighted by states' populations. Standard errors in parentheses. Standard errors are clustered at the state level. All specifications use log dependent variables. All specifications include controls and state and year fixed effects. Controls include unemployment rate, median household income, percentages of black and white residents, and prisoner per 1,000 residents. Data from 1990 - 2004. In both panels, the reference group is states with no mental health insurance mandate. States that pass a legislation mid-year will have that state-year legislation dropped from the sample

Table 6: The effect of mental health insurance on property crime

Variable	Property crime (1)	Burglary (2)	Larceny theft (3)	Motor vehicle theft (4)
Panel A: access vs. no access to parity				
Access to parity	-0.06 (0.05)	-0.10 (0.06)	-0.03 (0.04)	-0.18* (0.10)
No Access to parity	0.01 (0.03)	-0.00 (0.05)	0.03 (0.03)	-0.06 (0.06)
Panel B: all mandates				
Parity	-0.02 (0.04)	-0.05 (0.05)	-0.01 (0.04)	-0.07 (0.06)
Mandated offering	-0.15** (0.07)	-0.20* (0.10)	-0.08* (0.05)	-0.39** (0.19)
MMB	0.01 (0.04)	0.00 (0.04)	0.03 (0.04)	-0.07 (0.06)
Mandated if offered	0.07* (0.04)	0.04 (0.05)	0.07 (0.04)	0.10 (0.08)
N	748	748	748	748

Notes: Each column in a panel is a separate regression. *, **, and *** indicate significance at the 10%, 5%, and 1% level. All regressions are weighted by states' populations. Standard errors in parentheses. Standard errors are clustered at the state level. All specifications use log dependent variables. All specifications include controls and state and year fixed effects. Controls include unemployment rate, median household income, percentages of black and white residents, and prisoner per 1,000 residents. Data from 1990 - 2004. In both panels, the reference group is states with no mental health insurance mandate. States that pass a legislation mid-year will have that state-year legislation dropped from the sample

Table 7: Robustness checks

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: violent crime						
Parity	0.05 (0.03)	0.06 (0.04)	0.04 (0.03)	0.04 (0.04)	0.02 (0.03)	0.01 (0.03)
Mandated offering	-0.18*** (0.05)	-0.19*** (0.05)	-0.13** (0.05)	-0.19*** (0.06)	-0.08* (0.04)	-0.04 (0.03)
MMB	0.10*** (0.03)	0.07* (0.04)	0.06* (0.04)	0.10*** (0.03)	0.06 (0.04)	0.01 (0.04)
Mandated if offered	-0.02 (0.04)	-0.03 (0.04)	-0.03 (0.04)	-0.00 (0.05)	-0.03 (0.04)	-0.03 (0.04)
Panel B: property crime						
Parity	-0.02 (0.04)	-0.02 (0.04)	-0.03 (0.03)	-0.02 (0.04)	-0.05 (0.04)	-0.05* (0.03)
Mandated offering	-0.15** (0.07)	-0.15** (0.07)	-0.15*** (0.05)	-0.12* (0.07)	0.01 (0.06)	-0.05 (0.04)
MMB	0.01 (0.04)	0.01 (0.04)	0.01 (0.04)	0.02 (0.03)	-0.01 (0.04)	-0.03 (0.03)
Mandated if offered	0.07* (0.04)	0.07 (0.04)	0.02 (0.05)	0.10** (0.04)	0.06 (0.04)	0.03 (0.04)
N	748	748	549	748	719	528
MMB - Parity transition	No	Yes	No	No	No	Yes
Crack index	No	No	Yes	No	No	Yes
Region*Year fixed effects	No	No	No	Yes	No	Yes
Excluding NY & CA	No	No	No	No	Yes	Yes

Notes: Each column in a panel is a separate regression. *, **, and *** indicate significance at the 10%, 5%, and 1% level. All regressions are weighted by states' populations. Standard errors in parentheses. Standard errors are clustered at the state level. All specifications use log dependent variables. All specifications include controls and state and year fixed effects. Controls include unemployment rate, median household income, percentages of black and white residents, and prisoner per 1,000 residents. Data from 1990 - 2004. The reference group is states with no mental health insurance mandate. States that pass a legislation mid-year will have that state-year legislation dropped from the sample.

Table 9: Event study analysis

Year(s) relative to enactment	Years before			Years after		
	3+	2	1	1	2	3+
Log violent crime relative to enactment year	0.04 (0.21)	0.03 (0.11)	0.03 (0.08)	-0.01 (0.07)	-0.02 (0.11)	-0.06 (0.25)

Notes: Sample consists of mandated offering states only. Sample size: N = 60. *, **, and *** indicate significance at the 10%, 5%, and 1% level. All regressions are weighted by states' populations. Standard errors in parentheses. Standard errors are clustered at the state level. All specifications use log dependent variables. Data from 1990 - 2004. The reference group is the year a legislation is passed.