The Effect of Reduced Coverage for Inpatient Psychiatric Care on Emergency Department Utilization

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Abstract
This paper examines the effect of reduced insurance coverage for inpatient psychiatric care on emergency department utilization. I examine this relationship by exploiting Medicaid’s Institutions for Mental Disease exclusion, which states that for beneficiaries between the age of 21 and 64, inclusive, Medicaid will not reimburse for medically necessary inpatient psychiatric care administered at an institution with more than sixteen beds. I employ a “fuzzy” regression discontinuity framework using the near universe of emergency department and inpatient discharge records from 2005 through 2011 for two states. For Medicaid-eligible men, I find that at age 21 reduced coverage for inpatient psychiatric care increases mental health emergency department visits by 11 percent. For Medicaid-eligible women, I tend to find statistically insignificant effects. To address the concern that the minimum legal drinking age has a confounding effect at age 21, I define my outcome variable to exclude all alcohol-related visits. I also conduct a placebo test to check that there is no discontinuity in this outcome for private insurance beneficiaries (i.e., individuals that do not experience a change in insurance coverage at age 21). Consistent with the hypothesis that my outcome variable is not confounded by alcohol use at age 21, I find no discontinuity in mental health emergency department visits for this group. We can, therefore, interpret the increase in mental health emergency department visits as the unintended cost of reduced coverage for inpatient psychiatric care.

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1 Introduction

In the United States, approximately one in five adults has a mental illness. According to mental health advocates and researchers, each year many of these Americans fail to receive medically necessary treatment for their mental illness (Fuller et al., 2016; Bose et al., 2016). Research suggests that the problem with delaying, or not receiving, medically necessary treatment is twofold. First, psychiatric treatments are effective at addressing the symptoms associated with mental illness (Bartak et al., 2011; Creed et al., 1997). Second, delaying treatment could result in a worsening of symptoms, and over time the illness may become less responsive to treatment (Haas et al., 1998; Loebel et al., 1992; Norman and Malla, 2001).

In 2015 the Substance Abuse and Mental Health Services Administration conducted their National Survey on Drug Use and Health. The results of that survey suggest that in 2015 approximately 43 million adults in the United States had a mental illness, and approximately 10 million had a serious mental illness (Bose et al., 2016). In addition, 57 percent of those with a mental illness and 35 percent of those with a serious mental illness did not receive treatment that year (Bose et al., 2016). It has been observed that when traditional treatment options are not available (i.e., inpatient psychiatric care), individuals turn to the emergency department for care (Torrey et al., 2012; Fuller et al., 2016; Szabo, 2014). However, if the emergency department is not equipped to stabilize their psychiatric symptoms, they could be boarded in either a private room or hallway until an inpatient psychiatric bed becomes available (Fuller et al., 2016; Torrey et al., 2012). Many contend that this practice negatively affects the care given to emergency department patients by increasing wait times and reducing the availability of emergency department beds (Nicks and Manthey, 2012; Richards et al., 2014). Despite the above observations, there is no causal evidence regarding the relationship between untreated mental illness and emergency department utilization.

I, therefore, contribute to the current literature by providing valuable causal evidence for the effect of reduced insurance coverage for inpatient psychiatric care on emergency department utilization. Specifically, I use a regression discontinuity framework to estimate

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1The definition of serious mental illness for children is as follows: children (i.e., birth to the age of 18) with a diagnosed mental illness listed in the DSM-III-R (or the equivalent diagnosis in ICD-9-CM), where the diagnosis interferes with their ability to function in daily activities. The same definition applies to adults, but the age range is 18 years or older (SAMHSA, 1993).

2For example, if an individual experiences a psychiatric emergency medical condition (EMC), they could be sent to the emergency department for care. The Emergency Medical Treatment and Labor Act (EMTALA) of 1986 mandates that hospitals participating in Medicare examine any person who comes to the emergency department with an EMC. Per the EMTALA, an EMC is defined as “a medical condition manifesting itself by acute symptoms of sufficient severity (including severe pain, psychiatric disturbances and/or symptoms of substance abuse) such that absence of immediate medical attention could reasonably be expected to result in (i) placing the health of the individual... in serious jeopardy; (ii) serious impairment to bodily functions; or (iii) serious dysfunction of any bodily organ or part” (42 CFR 489.24(b)).
the relationship between insurance coverage for inpatient psychiatric care and emergency department visits.\(^3\) I exploit the variation in coverage for inpatient psychiatric care that results from Medicaid’s Institutions for Mental Disease (IMD) exclusion to study this relationship. Medicaid’s IMD exclusion states that, for beneficiaries between the age of 21 and 64, inclusive, Medicaid will not reimburse for medically necessary inpatient psychiatric care administered at an institution with more than sixteen beds. In practice, this means that Medicaid beneficiaries experience a reduction in coverage for inpatient psychiatric care at age 21.\(^4\)

To estimate the relationship between coverage for inpatient psychiatric care and emergency department visits, I use the near universe of emergency department and inpatient discharge records from Arizona and Kentucky.\(^5\) I report separate estimates for men and women because of the well-documented gender differences with respect to the age of onset for certain mental illnesses (Kessler et al., 2007; Astbury, 2001). I also stratify my estimates by expected payer type, and I do this for the following reason. At age 21, Medicaid beneficiaries experience a reduction in coverage for inpatient psychiatric care. I, therefore, expect to find a discontinuity in mental health visits for the population of Medicaid-eligible individuals (i.e., the expected payer is either Medicaid or self-pay). My results are consistent with the above. For Medicaid-eligible men, I find robust negative effects of reduced coverage for inpatient psychiatric care on mental health emergency department visits (excluding alcohol-related visits). These effects are large, on the order of 11 percent. I do not observe statistically significant effects for Medicaid-eligible women.

My results provide robust evidence in support of the claim that there is a relationship between untreated mental illness and emergency department utilization. At a minimum, this reduction in coverage for inpatient psychiatric care imposes an external cost on emergency departments and their patients. Work by Nicks and Manthey (2012) quantifies this cost and

\(^3\)Previous research has demonstrated that insurance coverage increases health care utilization (Brook et al., 1984; Finkelstein et al., 2012; Anderson et al., 2012; Card et al., 2008, 2009). Therefore, it is not unreasonable to assume that a reduction in coverage for inpatient psychiatric care will lead to a reduction in the utilization of inpatient psychiatric care. This reduced utilization of inpatient psychiatric care could translate to an increase in emergency department visits.

\(^4\)Similar identification strategies have been used by Anderson et al. (2012), Card et al. (2008), and Card et al. (2009) to estimate the effects of insurance coverage on other outcomes. For example, Anderson et al. (2012) study the effect of insurance coverage on emergency department visits by exploiting a change in insurance coverage for young adults. They find that being uninsured results in a decrease in emergency department visits. Similarly, Card et al. (2008, 2009) find that Medicare eligibility increases the use of medical care and reduces the probability of death within seven days of admission by 20 percent.

\(^5\)I selected these states because several years of emergency department and inpatient data are available, and the Medicaid eligibility cutoff for children is 19 and not 21 years old. The eligibility cutoff occurring at age 19 (and not 21) is important because I want to identify the effect of reduced insurance coverage for inpatient psychiatric care at age 21.
suggests that psychiatric boarding in the emergency department is associated with the loss of two bed turnovers per psychiatric patient. For the emergency department, this reduction in bed turnovers translates to a loss of 2,264 dollars per psychiatric patient. Additionally, research by Richards et al. (2014) suggests that the practice of boarding patients in hallways is associated with increased patient morbidity and mortality, where this effect is for both psychiatric and non-psychiatric patients. Many argue that the effects of untreated mental illness could be much larger, affecting incarceration, homelessness, and an individual’s ability to work on both the intensive and extensive margin (Torrey et al., 2012; Fuller et al., 2016; Slade and Salkever, 2001; Wu et al., 2005).\textsuperscript{6}

To address the confounding effect of the minimum legal drinking age at 21, I define my outcome variable to exclude all alcohol-related visits. Specifically, I exclude the ICD-9-CM codes used in Carpenter and Dobkin (2017), and I show that my results for Medicaid-eligible men are robust to this exclusion.\textsuperscript{7} I also conduct a placebo test to verify that there is no discontinuity in this outcome for private insurance beneficiaries (i.e., individuals that do not experience a change in insurance coverage at age 21). Consistent with the hypothesis that my outcome variable is not confounded by alcohol use at age 21, I find no discontinuity in mental health emergency department visits for this group.

\section{Medicaid’s IMD Exclusion}

Medicaid is a means-tested health insurance program that is jointly funded by the Federal Government and States. Medicaid eligible individuals include low-income families, pregnant women and children (defined as less than 19 in some states and 21 in others) from low-income households, and individuals receiving Supplemental Security Income benefits. Age-based eligibility rules like these have been exploited by Card et al. (2008), Card et al. (2009), and Anderson et al. (2012).

Under federal law, certain Medicaid benefits are mandatory (e.g., family planning services, physician services, etc.). But some benefits are optional, and it is up to the States to decide what will be covered (e.g., dental services, eyeglasses, etc.). Moreover, some services are not covered when provided to certain subgroups of Medicaid beneficiaries. The IMD exclusion is an example of the latter.

To see what this means in practice, let us consider coverage for inpatient psychiatric

\textsuperscript{6}In future work I will study the effect of coverage for inpatient psychiatric care on these potential external and internal costs.

\textsuperscript{7}Carpenter and Dobkin (2017) study the effect of the minimum legal drinking age on emergency department visits. They find that at age 21 emergency department visits increase by 71 per 10,000 person-years.
care by comparing two health insurance plans in each state (i.e., Medicaid versus a private insurance plan in Arizona and Kentucky). Specifically, the following section (and Figure 1) compares the inpatient psychiatric benefits of Medicaid to Anthem Blue Cross and Blue Shield of Kentucky Silver HMO 3500 and Aetna Leap Everyday HMO in Arizona.

Medicaid provides screening, diagnostic, and treatment services to all Medicaid beneficiaries less than 21 years old for at most a small monthly premium. In Arizona, Medicaid beneficiaries are not responsible for copayments if the child is less than 19 years old, but they are responsible for a small monthly premium. Medicaid beneficiaries in Kentucky, however, are not responsible for copayments or monthly premiums. Once a Medicaid beneficiary turns 21, regardless of their state of residence, their inpatient psychiatric care is only covered by Medicaid if it is administered in an institution with 16 or fewer beds. Since there are relatively few institutions with sixteen or fewer beds, at age 21, Medicaid beneficiaries experience a reduction in coverage for inpatient psychiatric care. This rule is referred to as the IMD exclusion, and it has been in effect since Medicaid was created in 1965.

In contrast, in 2017, the BCBSKY Silver HMO 3500 plan covers half the cost of inpatient mental health services. That is, once the beneficiary has met their 3500 dollar deductible, they are responsible for paying 500 dollars plus 50 percent coinsurance of inpatient hospital facility, residential, and physician fees resulting from mental health inpatient care. Beneficiaries of Arizona’s Aetna Leap Everyday plan are responsible for 0 percent coinsurance after meeting their 5000 dollar deductible. Unlike Medicaid, these benefits are not conditional on the number of beds in the inpatient facility, or the beneficiaries age. That is to say that, since these private plans are not associated with a reduction in coverage, at the age 21 threshold there will be a reduction in coverage that is equal to the fraction of Medicaid beneficiaries that are just less than 21.

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8Inpatient psychiatric care services are 24-hour services provided in a licensed hospital. These services include clinical interventions for mental health, substance abuse, or both.

9For the purposes of this comparison, I identified an Anthem Blue Cross Blue Shield of Kentucky (BCBSKY) plan for a household of one adult (i.e., 30 years old), with an annual household income equal to the median for Kentucky, and who visits the doctor a few times a year. After identifying an insurance plan available to Kentucky residents, I identified a comparable plan for Arizona residents.

10There are relatively few institutions with 16 or fewer beds available. For example, in 2015, approximately 6 percent of Arizona’s inpatient psychiatric beds and 3 percent of Kentucky’s inpatient psychiatric beds were located in an institution with 16 or fewer beds.

11In 1967, the IMD exclusion became binding for all states when the Early and Periodic Screening, Diagnostic, and Treatment (EPSDT) component of Medicaid was introduced. There are a few exceptions to the IMD exclusion, however: (i) if the Medicaid beneficiary is less than 21 years old, (ii) the inpatient psychiatric institution has 16 or fewer beds, or (iii) the Medicaid beneficiary was already receiving inpatient psychiatric care in an IMD when they turned 21. Also, as of 2016, the Centers for Medicare and Medicaid Services allows the in lieu of rule to be applied to IMDs. Specifically, the in lieu of rule states that, for Medicaid beneficiaries between the age of 21 and 64, Medicaid will reimburse for inpatient psychiatric care administered at an IMD if the alternative inpatient setting is more expensive.
3 Empirical Strategy

To understand the empirical strategy used in this paper, let us begin by assuming that I can measure insurance coverage for inpatient psychiatric care and emergency department utilization. In that case, I would estimate the relationship between coverage and emergency department utilization using the standard “fuzzy” RD framework. I would begin with an equation for the relationship between Medicaid’s IMD exclusion and insurance coverage for inpatient psychiatric care (i.e., the first-stage):

\[ COV_m = \gamma_0 + \gamma_1 AGE21_m + f(AGE_m) + \nu_m \]  

The dependent variable \( COV_m \), is an indicator for insurance coverage for inpatient psychiatric care for age in months group \( m \); \( AGE \) is age in months relative to the threshold (i.e., \( AGE = 0 \) if the patient is 21 and 0 months at time of visit); \( f(AGE) \) captures the relationship between the dependent variable and age in months; and \( AGE21 \) is an indicator taking a value of 1 if \( AGE \) is \( \geq 0 \). The parameter of interest, \( \gamma_1 \), captures the effect of the IMD exclusion on coverage for inpatient psychiatric care.

Next, I would define an equation that describes the relationship between insurance coverage and emergency department utilization (i.e., the second-stage):

\[ ED_m = \beta_0 + \beta_1 COV_m + f(AGE_m) + \epsilon_m \]  

The dependent variable, \( ED_m \), is the person-year rate for emergency department visits for age in months group \( m \). The parameter of interest, \( \beta_1 \), captures the effect of insurance coverage on the rate of emergency department visits. However, since coverage for inpatient psychiatric care is not randomly assigned, using least squares to estimate this relationship would likely result in a biased estimate for \( \beta_1 \). For that reason, I would use the first two equations to estimate \( \beta_1 \) via two-stage least squares; where \( AGE21 \) instruments for coverage, \( COV \).

In practice, however, there are two key differences between the data used here and the data required to implement the above. First, I do not have a clean measure of the treatment (i.e., insurance coverage for inpatient psychiatric care). Using data from the Current Population Survey (CPS), I know the first-stage relationship will be approximately 0.30 (see my back-of-the-envelope first-stage illustrated in Figures 2 and 3), but I do not have the
data to implement two-stage least squares.\textsuperscript{12} Instead, I report the reduced form estimates in Section 5, and I discuss the implied treatment effects in Section 6. Second, I do not have the right population estimates for the denominator on the outcome measure (i.e., the rate of emergency department visits). Instead, I use the logged count of emergency department visits. Card et al. (2008) do something similar, and as they point out, if the population trends smoothly then the estimated discontinuity can be interpreted as the percent change in the rate of emergency department visits.\textsuperscript{13} That is, using the logged count of emergency department visits for 24 months on either side of the threshold, I estimate the following reduced-form model:

\[ ED_m = \delta_0 + \delta_1 \text{AGE21}_m + f(\text{AGE}_m) + \zeta_m \]  

When using an RD framework, one concern is that there could be another discontinuity source at the threshold you are exploiting. A potential issue with the above estimation strategy is that 21 is the minimum legal drinking age in the United States, and therefore, could have confounding effects on the outcomes of interest. Recall that Carpenter and Dobkin (2017) find an increase in the rate of emergency department visits and alcohol-related injuries at age 21. To address this potential threat to identification, two of my measures for mental health emergency department visits exclude the ICD-9-CM codes used in Carpenter and Dobkin (2017) (i.e., two of my measures are based on diagnosis codes that are not associated with alcohol-related visits).

\subsection*{3.1 The Identifying Assumption}

For this empirical strategy, the key identifying assumption is that the distribution of potential outcomes is smooth at the threshold. That is to say that, individuals must have imprecise control over the running variable (i.e., age in months). If true, then we can assume that the treatment (i.e., turning 21) is as good as randomly assigned near the threshold, and we can attribute any discontinuity at the threshold to the treatment. Since the potential outcomes are functions of observed and unobserved characteristics, we cannot test this assumption directly. However, we can evaluate the distributions of observed characteristics. If these distributions are smooth at the threshold, then that suggests that the treatment is as

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\textsuperscript{12}To implement two-stage least squares, I would need a measure of the treatment, age in months, emergency department visits and the diagnosis codes for those visits, gender, and expected payer type. What I have is the near universe of emergency department visits for Arizona and Kentucky between 2005 and 2011. That data includes age in months, emergency department visits and the diagnosis codes for those visits, gender, and expected payer type.

\textsuperscript{13}Table A1 in the Appendix presents estimates that are comparable to those from Carpenter and Dobkin (2017).
good as randomly assigned near the threshold.

I test the above assumption by studying the distribution of non-deferrable admissions (i.e., an observable characteristic that is unaffected by the treatment). If the distribution is smooth at the threshold, then that suggests two things. First, nothing else is changing at age 21 that affects emergency department access. Second, individuals have imprecise control over the running variable. Per Card et al. (2009), we can define any diagnosis with an equal probability of showing up in the emergency department during a weekday or weekend as non-deferrable (i.e., the fraction of weekend admissions for non-deferrable diagnoses should be equal to 2/7). In other words, these are conditions for which, all else being equal, we would not expect the likelihood of showing up in the emergency department to change discretely by age. Figure 4 plots this distribution, and suggests that individuals have imprecise control over the running variable.

4 Data

This paper uses emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project (HCUP). The emergency department and inpatient discharge records represent the near universe of discharges for Arizona, and Kentucky from 2005 through 2011. Some emergency department visits result in an inpatient admission (i.e., these records are not defined as emergency department discharges), so my sample includes the inpatient discharges that originated in the emergency department. The empirical strategy employed in this paper relies on knowing the age in months for each emergency department patient. This information is available for emergency department visits in Arizona between 2005 and 2009, and emergency department visits in Kentucky between 2008 and 2011. In addition to the above, these records also provide detailed information on the

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14The following is a list of the top ten non-deferrable diagnoses for individuals 19 to 23, inclusive: (i) other disorders of the urethra and urinary tract, (ii) pregnancy - hemorrhage, (iii) symptoms involving the digestive system, (iv) upper respiratory infection, (v) acute bronchitis, (vi) asthma, (vii) bronchitis not specified as acute or chronic, (viii) kidney infections, (ix) symptoms involving skin and like tissue, and (x) inflammatory diseases of the cervix, vagina, and vulva.

15In 2011, 1.8 percent of the American Hospital Association (AHA) emergency department visits were not included in Arizona’s emergency department discharge records. For that same year, less than 1 percent of the AHA emergency department visits were not included in Kentucky’s emergency department discharge records.

16Recall that I selected these states because several years of emergency department and inpatient data are available, and the Medicaid eligibility cutoff for children is 19 and not 21 years old. Emergency department records are available for Arizona (via HCUP) starting in 2005, and the same data are available for Kentucky starting in 2008. For Arizona’s emergency department discharge records, 2009 is the last year that birth month is included in the data. Due to the implementation of the Affordable Care Act, I do not look at emergency department data beyond 2011.
specific diagnoses (i.e., the actual ICD-9-CM codes) associated with each emergency department visit, the expected primary payer, and the month and year of visit. For this analysis, I focus on individuals between the age of 19 and 23, inclusive, resulting in a raw sample size of 1,409,323 emergency department visits.

Much of my analysis focuses specifically on mental health emergency department visits. To uniquely identify these types of visits, I look at the first three ICD-9-CM diagnosis codes listed on each record (i.e., the primary and first two secondary diagnosis codes); where ICD-9-CM codes 290 through 319 indicate a mental illness diagnosis. Table 1 lists the ten most frequent primary mental illness diagnoses for Medicaid-eligible individuals between 19 and 23 years old, inclusive. As Table 1 indicates, the most frequent ICD-9-CM mental illness diagnosis codes include certain forms of alcohol and drug use, and alcohol and drug dependence. To identify visits specifically related to mental health, I define three measures of mental health emergency department visits with varying degrees of restriction on drug and alcohol-related visits.

I begin with a measure of mental health emergency department visits without any restrictions on drug and alcohol-related ICD-9-CM diagnosis codes for mental illness. This measure, however, is problematic because it will also likely capture the effect of the minimum legal drinking age in the United States. Therefore, my second measure of mental health emergency department visits excludes the diagnosis codes used in Carpenter and Dobkin (2017) (i.e., ICD-9-CM codes 291, 303, and 3050). My third measure of mental health emergency department visits is based solely on the primary diagnosis code and excludes visits with a primary diagnosis code for drugs or alcohol. Some might be concerned that this measure allows for comorbidity of mental illness and substance abuse. While this measure could capture comorbidity of mental illness and substance abuse, according to previous research this type of comorbidity is common (Regier et al., 1990).

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the data used in this analysis. For female patients, comparing the fraction of non-mental health emergency department visits to mental health emergency department visits suggests that fewer women are visiting the emergency department because of a mental illness diagnosis. This pattern is consistent with Astbury (2001) who observes that men have an earlier age of onset for some mental disorders like schizophrenia. That is, for the age range considered in this analysis, we would expect to see a larger fraction of male patients visiting the emergency department because of a mental illness diagnosis.
Next, let us compare non-mental health and mental health emergency department visits by the primary expected payer. For Medicaid beneficiaries, this comparison suggests that the fraction of mental health visits is greater than the fraction of non-mental health emergency department visits. The same pattern is observed when the primary expected payer is self-pay, however, the alternative is true for private insurance beneficiaries. In other words, the data suggests that Medicaid-eligible individuals (i.e., the expected payer is either Medicaid or self-pay) are more likely to present in the emergency department with a mental illness diagnosis than private insurance beneficiaries.

5 Results

In this section, I present the estimates from the reduced form model described in equation (3) using a 24 month bandwidth. Figures 5 through 12 plot the age profiles for the logged count of emergency department visits, stratified by gender and expected payer (i.e., Medicaid-eligible and private insurance). Each point on these Figures represents the logged count of emergency department visits for each age in month group, and the lines are the fitted linear trends from equation (3) using a 24 month bandwidth. In the United States, when someone turns 21 two things occur. First, they can legally consume alcohol. Second, if they are a Medicaid beneficiary, they will experience a reduction in coverage for inpatient psychiatric care. Therefore, we would expect to find a discontinuity in emergency department visits for both men and women (i.e., due to alcohol use and a reduction in coverage for inpatient psychiatric care at age 21). However, given what we know about the age of onset for certain mental illness diagnoses, we would expect this discontinuity (due to the reduction in coverage) to be larger for men. Further, we would expect to observe a discontinuity (due to the reduction in coverage) for Medicaid-eligible individuals (i.e., the expected payer is either Medicaid or self-pay), but not for private insurance beneficiaries (i.e., individuals who do not experience a reduction in insurance coverage for inpatient psychiatric care at age 21).

Figures 5 and 6 plot the age profiles for the logged count of emergency department visits stratified by gender and expected payer. Table 3, row 1, columns 2 and 4 report the estimates for the discontinuities illustrated in Figure 5, and indicate that at age 21 Medicaid’s IMD exclusion increases emergency department visits by 3 percent for Medicaid-eligible men (i.e., the expected payer is either Medicaid or self-pay). For Medicaid-eligible women, I do not observe a statistically significant effect. When the expected payer is private insurance, I find that at age 21 Medicaid’s IMD exclusion increases emergency department visits by 4 and 1 percent for men and women, respectively.

One concern with the above estimates is that they do not account for the confounding
effect of alcohol- and drug-related visits at age 21. For that reason, I define three measures of mental health emergency department visits with varying degrees of restriction on alcohol- and drug-related visits. Figures 7 and 8 plot the age profiles for the unrestricted logged count of mental health emergency department visits stratified by gender and expected payer. Table 3, row 2, columns 2 and 4 report the estimates for the discontinuities observed in Figure 7, and indicate that at age 21 Medicaid’s IMD exclusion increases unrestricted mental health visits by 7 percent for Medicaid-eligible men. For Medicaid-eligible women, I find that at age 21 Medicaid’s IMD exclusion increases unrestricted mental health visits by 2 percent. When the expected payer is private insurance, I find that at age 21 Medicaid’s IMD exclusion increases unrestricted mental health visits by 7 percent for men. For women, I observe a statistically insignificant effect.

Recall that alcohol use and dependence are classified as mental illnesses. For that reason, this unrestricted measure does not adequately account for the confounding effect of alcohol use at age 21. Therefore, I proceed with my analysis using a measure of mental health emergency department visits that excludes all alcohol-related diagnosis codes (i.e., the ICD-9-CM codes used in Carpenter and Dobkin (2017)). Figures 9 and 10 plot the age profiles for the logged count of restricted mental health emergency department visits for men and women. Table 3, row 3, columns 2 and 4 report the estimates for the discontinuities observed in Figure 9, and indicate that at age 21 Medicaid’s IMD exclusion increases restricted mental health visits by 3.5 percent for Medicaid-eligible men. This 3.5 percent increase translates to an additional 33 visits per 10,000 person-years. Once again, for Medicaid-eligible women, I do not observe a statistically significant effect. When the expected payer is private insurance, I find that at age 21 Medicaid’s IMD exclusion does not have a statistically significant effect on restricted mental health visits for men or women. This finding is consistent with my hypothesis that this restricted measure of mental health emergency department visits is not confounded by alcohol use at age 21.

Lastly, Figures 11 and 12 plot the age profiles for the logged count of mental health emergency department visits based on the primary diagnosis code only, and excluding primary diagnosis codes for drugs and alcohol. Table 3, row 4, columns 2 and 4 report the estimates for the discontinuities observed in Figure 11, and indicate that at age 21 Medicaid’s IMD exclusion increases mental health visits by 14 percent for Medicaid-eligible men. In other words, for Medicaid-eligible men, at age 21 Medicaid’s IMD exclusion increases emergency department visits by 18 visits per 10,000 person-years. As with the previous outcomes, I do not observe a statistically significant effect for Medicaid-eligible women. When the expected payer is private insurance, I do not find a statistically significant effect for men or women.
6 Discussion of Results

In this section, I discuss the estimated treatment effects and the potential costs associated with these effects. Up to this point, all of the results that have been discussed are reduced form estimates. To identify the causal effect of reduced coverage on emergency department visits, these estimates must be scaled by first-stage estimates. Recall that I do not have a measure of coverage for inpatient psychiatric care, so I am unable to estimate the first-stage. However, using data from the CPS, and assuming that all Medicaid beneficiaries lose coverage for inpatient psychiatric care at age 21, via a back-of-the-envelope calculation I approximate the first-stage for Medicaid-eligible individuals (i.e., the expected payer is either Medicaid or self-pay).

I begin by verifying that there is no discontinuity in Medicaid coverage at age 21. Figure 13 plots the age profiles for the fraction of Medicaid beneficiaries in Arizona and Kentucky, and illustrates that coverage is smooth at the threshold. Since the fraction of Medicaid beneficiaries is smooth at the threshold, I can attribute any reduction in coverage for inpatient psychiatric care at age 21 to Medicaid’s IMD exclusion. That said, at age 19 there is a reduction in the fraction of Medicaid beneficiaries. This reduction is expected and due to the fact that in Arizona and Kentucky children can qualify for Medicaid through their parents until the age of 19.

Having verified that the fraction of Medicaid beneficiaries is smooth through the threshold, I proceed with my back-of-the-envelope calculation for the relationship between Medicaid’s IMD exclusion and coverage for inpatient psychiatric care. Currently, there are relatively few institutions with 16 or fewer beds, so I begin by assuming that all Medicaid beneficiaries experience a reduction in coverage at age 21. That is, at the threshold, I assume that the reduction in coverage for inpatient psychiatric care is equal to the fraction of Medicaid beneficiaries that are just less than 21. Figures 2 and 3 illustrate my back-of-the-envelope calculation, and suggest that at age 21 coverage decreases by 32 percent for men and 30 percent for women.

Scaling the reduced-form estimate for restricted mental health emergency department visits, I proceed with my back-of-the-envelope calculation for the relationship between Medicaid’s IMD exclusion and coverage for inpatient psychiatric care. Currently, there are relatively few institutions with 16 or fewer beds, so I begin by assuming that all Medicaid beneficiaries experience a reduction in coverage at age 21. That is, at the threshold, I assume that the reduction in coverage for inpatient psychiatric care is equal to the fraction of Medicaid beneficiaries that are just less than 21. Figures 2 and 3 illustrate my back-of-the-envelope calculation, and suggest that at age 21 coverage decreases by 32 percent for men and 30 percent for women.

17 The Wald estimator is the reduced form estimate scaled by the first-stage estimate (i.e., using the notation from equations (1) through (3), $\beta_1 = \frac{\delta_1}{\gamma_1}$) and consistently estimates the LATE.

18 I attempt to estimate the first stage using data from California’s Office of Statewide Health Planning and Development (OSHPD) Annual Survey of Hospitals. Using this data, I estimate the fraction of people in California with inpatient psychiatric care covered by Medicaid. To the left of the threshold, the fraction of people with coverage is equal to the fraction of Medicaid beneficiaries. To the right of the threshold, the fraction of people with coverage is equal to the fraction of Medicaid beneficiaries who live in a county with an inpatient psychiatric hospital with 16 or fewer beds. These estimates suggest that at age 21 Medicaid’s IMD exclusion reduces coverage for inpatient psychiatric care in California by 9 to 10 percent. See Figures A2 and A3 in the Appendix.
visits by my back-of-the-envelope calculation, I find that reduced coverage for inpatient psychiatric care increases restricted mental health emergency department visits by 11 percent for Medicaid-eligible men. Repeating this exercise for the reduced form estimate for primary mental health emergency department visits, I find that reduced coverage increases these emergency department visits by 43 percent for Medicaid-eligible men. Since I assume that all Medicaid beneficiaries lose coverage at age 21, my back-of-the-envelope calculation likely overstates the true first-stage. In other words, we can think of these estimates as representing the lower bound for the treatment effect.

In terms of cost, what does the increase in emergency department visits mean for Medicaid? Using the emergency department discharge data, I determine that the average total charge for restricted mental health visits is 2,289 dollars.\textsuperscript{19} In comparison, the average cost of inpatient psychiatric care is 5,918 dollars.\textsuperscript{20} That is to say that, it would take 2.6 restricted mental health emergency department visits to exceed the cost of reimbursing for inpatient psychiatric care. Previous research observes that psychiatric patients have on average two repeat emergency department visits (i.e., the original visit and two repeat visits). For example, Dhossche and Ghani (1998) observe that, over a seven month period, the average number of visits for psychiatric patients was approximately 3. This observation is consistent with Mahajan et al. (2009), who observe that between 2003 and 2005 the average number of repeat visits for psychiatric patients 19 and younger is 2 (i.e., 3 visits in total).

In addition to the Medicaid-specific costs, reduced coverage for inpatient psychiatric care results in external costs for emergency departments. Nicks and Manthey (2012) quantify part of this cost, and suggest that psychiatric boarding in the emergency department is associated with the loss of two bed turnovers per patient. From the perspective of the emergency department, this reduction in bed turnovers translates to a loss of 2,264 dollars per psychiatric patient. Moreover, work by Richards et al. (2014) suggests that an increase in emergency department utilization results in patients being boarded in hallways. They argue that this practice is associated with an increase in patient morbidity and mortality for both psychiatric and non-psychiatric patients.

Further, mental health advocates and researchers contend that the costs of reduced coverage are potentially much larger than the Medicaid-specific and external costs discussed above. Specifically, they argue that reduced coverage for inpatient psychiatric care affects incarceration, homelessness, and an individual’s ability to work on the extensive and intensive margin (Torrey et al., 2012; Fuller et al., 2016; Slade and Salkever, 2001; Wu et al.,

\textsuperscript{19}This is for Medicaid-eligible men just less than 21 years old, and does not include professional fees or non-covered charges.

\textsuperscript{20}The estimate is based on the Medicaid reimbursed amounts for schizophrenia, bipolar, and depression reported in Stensland et al. (2012).
In fact, a recent report by Henry et al. (2016) suggests that 20 percent of those who are homeless or incarcerated suffer from a serious mental illness. In future research, I will study the relationship between reduced coverage for inpatient psychiatric care and these indirect and direct costs.

7 Conclusion

One out of every five adults in the United States has a mental illness, and according to mental health advocates and researchers, each year many do not receive medically necessary treatment (Fuller et al., 2016; Bose et al., 2016). It has been observed that when traditional treatment options are not available (i.e., inpatient psychiatric care), individuals experiencing symptoms associated with acute mental illness could turn to the emergency department for care (Torrey et al., 2012; Fuller et al., 2016; Szabo, 2014). However, if the emergency department is not equipped to stabilize their psychiatric symptoms, then they could be boarded in either a private room or hallway until an inpatient psychiatric bed becomes available (Fuller et al., 2016; Torrey et al., 2012). Previous research has found that this practice, known as boarding, negatively affects the care given to emergency department patients (Nicks and Manthey, 2012; Richards et al., 2014).

At present, there is no causal evidence regarding the effect of reduced insurance coverage for inpatient psychiatric care on emergency department utilization. This paper contributes to the current literature by providing valuable causal evidence for the effect of reduced insurance coverage on emergency department utilization. Specifically, I exploit Medicaid’s IMD exclusion to study the effect of reduced coverage for inpatient psychiatric care on emergency department visits. Using a “fuzzy” regression discontinuity framework, I find that reduced coverage for inpatient psychiatric care increases restricted mental health emergency visits (i.e., excluding alcohol-related visits) by 11 percent for Medicaid-eligible men. In addition, I find that reduced coverage for inpatient psychiatric care increases primary mental health emergency department visits by 43 percent for Medicaid-eligible men. For Medicaid-eligible women, I do not observe a statistically significant effect for either outcome.

Given the above, the implications of my findings are twofold. First, my results provide evidence in support of the claim that untreated mental illness increases emergency department utilization. Second, we can interpret this increase in emergency department use as an external cost of reduced insurance coverage for inpatient psychiatric care. More importantly, the sum of the costs associated with increased emergency department use has the potential to exceed the cost of inpatient psychiatric care.
# Tables

## Table 1: Primary Mental Illness Diagnosis Categories (Top Ten)

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anxiety Disorders</strong> (300)</td>
<td>[26.95%]</td>
</tr>
<tr>
<td>Nondependent Abuse of Drugs (305)</td>
<td>[24.56%]</td>
</tr>
<tr>
<td><strong>Depressive Disorders</strong> (311)</td>
<td>[11.76%]</td>
</tr>
<tr>
<td><strong>Episodic Mood Disorders</strong> (296)</td>
<td>[10.07%]</td>
</tr>
<tr>
<td>Drug-Induced Mental Disorders (292)</td>
<td>[4.47%]</td>
</tr>
<tr>
<td><strong>Special Symptoms or Syndromes Not Classified Elsewhere</strong> (307)</td>
<td>[3.19%]</td>
</tr>
<tr>
<td><strong>Schizophrenic Disorders</strong> (295)</td>
<td>[3.15%]</td>
</tr>
<tr>
<td><strong>Other Nonorganic Psychoses</strong> (298)</td>
<td>[3.02%]</td>
</tr>
<tr>
<td>Drug Dependence (304)</td>
<td>[2.50%]</td>
</tr>
<tr>
<td><strong>Adjustment Reaction</strong> (309)</td>
<td>[2.50%]</td>
</tr>
</tbody>
</table>

Note: This table reports the 10 most common mental illness diagnosis codes for Medicaid-eligible individuals between the ages of 19 and 23, inclusive. The diagnosis codes are reported in parenthesis, and frequencies are reported in brackets. The diagnosis codes not listed in bold text are excluded when defining restricted mental health emergency department visits (i.e., 291, 303, 3050) and primary mental health emergency department visits (i.e., 291, 292, 303, 304, and 305). Data source: Emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project.
Table 2: Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Pooled</th>
<th>Mental Health</th>
<th>Non-Mental Health</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Male Female</td>
<td>All Male Female</td>
</tr>
<tr>
<td>Female</td>
<td>0.609</td>
<td>– –</td>
<td>0.534 – –</td>
</tr>
<tr>
<td></td>
<td>(0.487)</td>
<td>– –</td>
<td>(0.498) – –</td>
</tr>
<tr>
<td>White</td>
<td>0.533</td>
<td>0.533 0.533</td>
<td>0.650 0.633 0.664</td>
</tr>
<tr>
<td></td>
<td>(0.498)</td>
<td>(0.498) (0.498)</td>
<td>(0.476) (0.481) (0.472)</td>
</tr>
<tr>
<td>Black</td>
<td>0.071</td>
<td>0.063 0.075</td>
<td>0.073 0.069 0.077</td>
</tr>
<tr>
<td></td>
<td>(0.257)</td>
<td>(0.243) (0.264)</td>
<td>(0.261) (0.254) (0.267)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.077</td>
<td>0.076 0.078</td>
<td>0.049 0.059 0.041</td>
</tr>
<tr>
<td></td>
<td>(0.267)</td>
<td>(0.265) (0.268)</td>
<td>(0.217) (0.235) (0.199)</td>
</tr>
<tr>
<td></td>
<td>(1.174)</td>
<td>(1.174) (1.174)</td>
<td>(1.169) (1.167) (1.170)</td>
</tr>
<tr>
<td>Arizona</td>
<td>0.523</td>
<td>0.531 0.518</td>
<td>0.411 0.456 0.389</td>
</tr>
<tr>
<td></td>
<td>(0.499)</td>
<td>(0.499) (0.499)</td>
<td>(0.492) (0.495) (0.487)</td>
</tr>
<tr>
<td>Kentucky</td>
<td>0.476</td>
<td>0.468 0.481</td>
<td>0.588 0.563 0.610</td>
</tr>
<tr>
<td></td>
<td>(0.499)</td>
<td>(0.499) (0.499)</td>
<td>(0.492) (0.495) (0.487)</td>
</tr>
<tr>
<td>Sample Size</td>
<td>1,409,323 551,045 858,278</td>
<td>211,260 98,423 112,837</td>
<td>1,198,063 452,622 745,441</td>
</tr>
<tr>
<td>Medicaid</td>
<td>0.318</td>
<td>0.198 0.395</td>
<td>0.303 0.227 0.370</td>
</tr>
<tr>
<td></td>
<td>(0.465)</td>
<td>(0.398) (0.488)</td>
<td>(0.459) (0.419) (0.482)</td>
</tr>
<tr>
<td>Private Insurance</td>
<td>0.272</td>
<td>0.294 0.258</td>
<td>0.223 0.231 0.215</td>
</tr>
<tr>
<td></td>
<td>(0.445)</td>
<td>(0.455) (0.437)</td>
<td>(0.416) (0.421) (0.411)</td>
</tr>
<tr>
<td>Self-Pay</td>
<td>0.297</td>
<td>0.366 0.253</td>
<td>0.355 0.404 0.311</td>
</tr>
<tr>
<td></td>
<td>(0.457)</td>
<td>(0.481) (0.434)</td>
<td>(0.478) (0.496) (0.463)</td>
</tr>
<tr>
<td>Sample Size</td>
<td>1,409,258 551,012 858,246</td>
<td>211,253 98,419 112,834</td>
<td>1,198,005 452,593 745,412</td>
</tr>
</tbody>
</table>

Notes: Standard deviations are reported in parenthesis. Mental Health represents mental health visits using the definition that excludes the ICD-9-CM codes used in Carpenter and Dobkin (2017) (i.e., excludes alcohol-related visits). Data source: Emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project.
<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate (&lt; 21)</td>
<td>RD at 21</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Medicaid-Eligible</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Admissions</td>
<td>4562</td>
<td>0.034***</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td></td>
</tr>
<tr>
<td>Mental Health</td>
<td>1028</td>
<td>0.068***</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Excluding Alcohol</td>
<td>931</td>
<td>0.035***</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Primary Diagnosis</td>
<td>131</td>
<td>0.139***</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td></td>
</tr>
<tr>
<td>Private Insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Admissions</td>
<td>1879</td>
<td>0.041***</td>
</tr>
<tr>
<td></td>
<td>(0.014)</td>
<td></td>
</tr>
<tr>
<td>Mental Health</td>
<td>308</td>
<td>0.073***</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Excluding Alcohol</td>
<td>271</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.024)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Primary Diagnosis</td>
<td>55</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>49</td>
<td>49</td>
</tr>
</tbody>
</table>

Note: *** = statistically significant at the 1% level; ** = statistically significant at the 5% level; * = statistically significant at the 10% level. Medicaid-eligible is used to describe the pool of individuals with an expected payer of either Medicaid or self-pay. The dependent variable is the logged count of emergency department visits. Each entry contains the results from a single local linear regression predicting the change in the outcome variable at age 21 using a 24 month bandwidth. Robust standard errors are reported in parenthesis. The estimates presented in this table correspond to the fitted jump (i.e., $\beta_1$ from equation (3)) at age 21. The rate provides an estimate for the rate of emergency department visits just to the left of the threshold (i.e., $AGE < 0$). Data source: Emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project.
Let’s assume:
(i) we have two identical individuals
(ii) with different health insurance providers

PERSON A:
Covered by private insurance (i.e., Anthem BCBS KY Silver Pathway HMO 3500 or Aetna Leap Everyday)

At 19 y.o., diagnosed with a mental illness requiring inpatient psychiatric care.

Pays $500 and 50% per admission after deductible, or 0% per admission after deductible.

Turns 21 y.o. and does not experience a disruption in care.

PERSON B:
Covered by Medicaid

At 19 y.o., diagnosed with a mental illness requiring inpatient psychiatric care.

Receives inpatient psychiatric care at no cost (no restrictions).

Turns 21 y.o., Medicaid will not reimburse for care administered at an IMD (i.e., an institution with more than 16 beds).*

TWO OPTIONS:

Receive inpatient psychiatric care at an inpatient facility with 16 or fewer beds.

Or wait for a psychiatric emergency medical condition to occur and go to the emergency department for care.

Note: *If a Medicaid beneficiary was receiving inpatient psychiatric care at an IMD when they turned 21, then they can complete their treatment at the IMD or leave the IMD once they turn 22 (whichever comes first).
Figure 2: Expected Relationship Between Coverage & Age (Medicaid-Eligible)

Notes: This figure illustrates my back-of-the-envelope first-stage. Each point represents the fraction of people (i.e., Medicaid beneficiaries and uninsured/self-pay) with inpatient psychiatric care covered by Medicaid. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: American Community Survey, Arizona and Kentucky, 2008 through 2011.

Figure 3: Expected Relationship Between Coverage & Age (Medicaid-Eligible)

Notes: This figure illustrates my back-of-the-envelope first-stage. Each point represents the fraction of people (i.e., Medicaid beneficiaries and uninsured/self-pay) with inpatient psychiatric care covered by Medicaid. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: American Community Survey, Arizona and Kentucky, 2008 through 2011.
9.1 Smoothness Check

Figure 4: Smoothness of Non-Deferable Diagnoses at the Threshold

Notes: The dependent variable is the logged count of non-deferable emergency department visits. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to age 21 and zero months). Data source: Healthcare Cost and Utilization Project.
9.2 Reduced Form - Emergency Department Visits

Figure 5: Emergency Department Visits - Medicaid-Eligible

Notes: The dependent variable is the logged count of emergency department visits for Medicaid-eligible men and women (i.e., the expected payer is either Medicaid or self-pay). Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Figure 6: Emergency Department Visits - Private Insurance

Notes: The dependent variable is the logged count of emergency department visits for men and women when the expected payer is private insurance. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Figure 7: Mental Health Emergency Department Visits - Medicaid-Eligible

Notes: The dependent variable is the logged count of mental health emergency department visits for Medicaid-eligible men and women (i.e., the expected payer is either Medicaid or self-pay). Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Notes: The dependent variable is the logged count of mental health emergency department visits for men and women when the expected payer is private insurance. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Figure 9: Restricted Mental Health Emergency Department Visits - Medicaid-Eligible

Notes: The dependent variable is the logged count of mental health emergency department visits (excluding alcohol) for Medicaid-eligible men and women (i.e., the expected payer is either Medicaid or self-pay). Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Notes: The dependent variable is the logged count of mental health emergency department visits (excluding alcohol) for men and women when the expected payer is private insurance. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Figure 11: Primary Mental Health Emergency Department Visits - Medicaid-Eligible

Notes: The dependent variable is the logged count of primary mental health emergency department visits (i.e., based on the primary diagnosis code only and excluding codes for drugs and alcohol) for Medicaid-eligible men and women (i.e., the expected payer is either Medicaid or self-pay). Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
Figure 12: Primary Mental Health Emergency Department Visits - Private Insurance

Notes: The dependent variable is the logged count of primary mental health emergency department visits (i.e., based on the primary diagnosis code only and excluding codes for drugs and alcohol) for men and women when the expected payer is private insurance. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: Healthcare Cost and Utilization Project.
9.3 Medicaid Beneficiaries in Arizona & Kentucky

Figure 13: Medicaid Coverage

Notes: The dependent variable is the fraction of Medicaid beneficiaries. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data source: American Community Survey, Arizona and Kentucky, 2008 through 2011.
## Appendix

### 10.1 Tables

Table A1: Reduced Form Estimates for Emergency Department Visits per 10,000 Person-Years

<table>
<thead>
<tr>
<th>Medicaid-Eligible</th>
<th>Rate (&lt; 21)</th>
<th>RD at 21</th>
<th>Rate (&lt; 21)</th>
<th>RD at 21</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Admissions</td>
<td>4562.345</td>
<td>185.638***</td>
<td>8405.234</td>
<td>40.616</td>
</tr>
<tr>
<td></td>
<td>(33.153)</td>
<td></td>
<td>(54.245)</td>
<td></td>
</tr>
<tr>
<td>Mental Health</td>
<td>1027.586</td>
<td>80.837***</td>
<td>1202.669</td>
<td>36.709**</td>
</tr>
<tr>
<td></td>
<td>(15.093)</td>
<td></td>
<td>(13.746)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Excluding Alcohol</td>
<td>930.979</td>
<td>41.058***</td>
<td>1159.432</td>
<td>9.360</td>
</tr>
<tr>
<td></td>
<td>(11.366)</td>
<td></td>
<td>(15.229)</td>
<td></td>
</tr>
<tr>
<td>Mental Health - Primary Diagnosis</td>
<td>131.301</td>
<td>20.148***</td>
<td>154.484</td>
<td>-6.528</td>
</tr>
<tr>
<td></td>
<td>(5.924)</td>
<td></td>
<td>(8.235)</td>
<td></td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>49</td>
<td></td>
<td>49</td>
<td></td>
</tr>
</tbody>
</table>

Note: *** = statistically significant at the 1% level; ** = statistically significant at the 5% level; * = statistically significant at the 10% level. The dependent variable is a rate per 10,000 person-years. Each entry contains the results from a single local linear regression predicting the change in the outcome variable at age 21. Robust standard errors are reported in parenthesis. The estimates presented in this Table correspond to the fitted jump (i.e., $\beta_1$ from equation (3)) at age 21. The constant provides an estimate for the rate of emergency department visits just to the left of the threshold (i.e., $AGE < 0$). Data source: Emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project.
Table A2: Reduced Form Estimates for Logged Count of Emergency Department Visits (with Controls)

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ FE (1)</td>
<td>+ Controls (2)</td>
</tr>
<tr>
<td><strong>Medicaid-Eligible</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>All Admissions</em></td>
<td>0.034***</td>
<td>0.033***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.002)</td>
</tr>
<tr>
<td><strong>Mental Health</strong></td>
<td>0.067***</td>
<td>0.067***</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Mental Health - Excluding Alcohol</strong></td>
<td>0.035***</td>
<td>0.035***</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
</tr>
<tr>
<td><strong>Mental Health - Primary Diagnosis</strong></td>
<td>0.136***</td>
<td>0.139**</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
</tr>
</tbody>
</table>

Note: *** = statistically significant at the 1% level; ** = statistically significant at the 5% level; * = statistically significant at the 10% level. The dependent variable is the logged count of emergency department visits. Each entry contains the results from a single local linear regression predicting the change in the outcome variable at age 21. Robust standard errors are reported in parenthesis. The estimates presented in this Table correspond to the fitted jump (i.e., $\beta_1$ from equation (3)) at age 21. +FE is the baseline specification described in equation (3) plus birth month fixed effects. + Controls is the baseline specification described in equation (3) plus birth month fixed effects and controls for race. Data source: Emergency department and inpatient discharge records from the Healthcare Cost and Utilization Project.
10.2 Figures

Figure A1: Mental Health Policy in the United States

- 1950
  - Thorazine is introduced in the United States.

- 1953
  - President Kennedy signs the Community Mental Health Act.

- 1954
  - President Johnson signs the Social Security Amendment creating Medicare & Medicaid.

- 1954
  - Thorazine is introduced in the United States.

- 1963
  - President Kennedy signs the Community Mental Health Act.

- 1965
  - President Johnson signs the Social Security Amendment creating Medicare & Medicaid.

- 1965
  - President Johnson signs the Social Security Amendment creating Medicare & Medicaid.

- 1980
  - President Carter signs the Mental Health Systems Act (MHSA).

- 1981
  - President Reagan repeals much of the MHSA through the Omnibus Budget Reconciliation Act.

- 1996
  - President Clinton signs the Mental Health Parity Act (MHPA).

- 1997
  - President Clinton signs the State Children’s health Insurance Program (SCHIP) into law.

- 2008
  - President Bush signs the Mental Health Parity and Addiction Equity Act (MHPAEA) into law.

- 2010
  - President Obama signs the Patient Protection & Affordable Care Act into law extending the reach of MHPAEA.

Sample Period (2005-2011)
Notes: The dependent variable is the fraction of people (i.e., Medicaid beneficiaries or self-pay) with inpatient psychiatric care covered by Medicaid; where data from California is used to approximate access to an inpatient psychiatric hospital with 16 or fewer beds. Age in months is relative to the age 21 threshold (i.e., age in months equal to zero corresponds to the age of 21 and zero months). Data sources: American Community Survey, and California’s Office of Statewide Health Planning and Development Annual Survey of Hospitals.
References


Szabo, L. (2014). Cost of not caring: Nowhere to go, the financial and human toll of neglecting the mentally ill. USA Today.
