THE EFFECT OF SUBSTANCE USE DISORDER PARITY MANDATES ON THE PRIVATELY INSURED POPULATION

By

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ABSTRACT

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The 2008 Mental Health Parity and Addiction Equity Act (MHPAEA) established the first federal-level parity coverage of substance use disorders (SUD). Before the MHPAEA, states passed their own SUD parity mandates. In addition, the Patient Protection and Affordable Care Act (PPACA) established Essential Health Benefit (EHB) benchmark plans to further extend SUD parity benefits. The objective of this thesis is to analyze state-level SUD parity mandates as well as the MHPAEA to investigate their effects on SUD treatment admissions and out-of-pocket expenditure burden. A two-way fixed effects approach, akin to the difference-in-differences (DD) framework, is used as the main identification strategy. In addition, an expanded three-way fixed effects approach, akin to the differences-in-differences (DDD) framework will be used to identify the effects among those with co-occurring psychiatric and substance abuse conditions

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KEY TO ABBREVIATIONS

BLS	Bureau of Labor Statistics
CBSA	Core-Based Statistical Area
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 th Edition
EHB	Essential Health Benefits
FEHB	Federal Employees Health Benefit
GAO	General Accounting Office (Before 2004); Government Accountability Office (After 2004)
НМО	Health Maintenance Organization
IFR	Mental Health Parity and Addiction Equity Act of 2008 Interim Final Rules
LAUS	Local Area Unemployment Statistics
MBHO	Managed Behavioral Healthcare Organization
MHPA	Mental Health Parity Act of 1996
MHPAEA	Mental Health Parity and Addiction Equity Act of 2008
NQTL	Nonquantitative Treatment Limitation
PPACA	Patient Protection and Affordable Care Act
QTL	Quantitative Treatment Limitation
SAMHDA	Substance Abuse and Mental Health Data Archive
SAMHSA	Substance Abuse and Mental Health Services Administration
TEDS-A	Treatment Episode Data Set- Admissions
SUD	Substance Use Disorder

INTRODUCTION

Early History of Behavioral Health Parity Mandates

Immediately following the creation of the Federal Employees Health Benefits (FEHB) health insurance plans for federal employees in 1959, President John F. Kennedy mandated parity-level coverage for mental health services. A first, this thorough mandate required equal coverage provisions for mental health and other physical ailments. After several years of paritylevel coverage, intense competition amongst FEHB plans has been cited as the main reason for the failure of parity provisions in FEHB plans (Hustead et al., 1985).

The single private insurance option that included mental health parity benefits was the High Option Plan sponsored by Blue Cross Blue Shield, a plan that attracted beneficiaries with high utilization of mental health services. After a few years of parity benefits, Blue Cross Blue Shield removed the provisions from their High Option Plan by 1981. After the elimination of the High Option benefits, some states began to pass mandates to establish a minimum level of benefits provided for mental health and alcoholism services. With the mandates establishing minimum levels of benefit, these early state-level parity mandates did not meet the true definition of parity (Hustead et al., 1985).

Concerns about an increase in costs due to behavioral health parity mandates ultimately contributed in the decline of states passing mandates. After the passage of early parity laws, researchers and insurers estimated the price elasticity of demand for mental health services in order to gauge how changes in the price for mental health services change the utilization for those services. The Rand Health Insurance Experiment (HIE), confirmed other smaller studies that the price elasticity of demand was twice as high for mental health services than for general medical and surgical services. In response, insurance companies though that higher costs would

drive up premiums, which led insurers to subsequently impose limits on mental health services in order to hedge against cost increases due to parity mandates. Most of the limits imposed by insurers were quantitative treatment limitations (QTLs), where insurers placed limits on the number of inpatient days and outpatient visits on both mental health and substance abuse treatment services. Researchers saw the imposition of QTLs by insurance companies as incentives to deal with risk-selection instead of moral hazard (Barry et al., 2006; Goldman et al., 2006).

The Mental Health Parity Act of 1996 (MHPA), the first federal-level mental health parity mandate, required the elimination of more restrictive annual and lifetime financial limits on mental health services when compared to the limits placed on general medical and surgical services. In addition, no provisions required parity in terms of QTLs or other cost-sharing measures. The MHPA required that only insurance plans that offered mental health benefits provide those benefits at parity only in terms of annual and financial limits. Small employers with less than 50 employees, individual insurance plans, and plans claiming more than a one percent increased burden in overall costs due to compliance were able to claim exemption from the MHPA mandates (United States General Accounting Office, 2000).

The United States General Accounting Office (GAO) conducted the official governmental evaluation of the MHPA and subsequently published the results in 2000. The evaluation included a survey of employers in states who had not passed a more comprehensive behavioral health parity mandate who offered health insurance plans that were subject to MHPA provisions. Almost every surveyed health plan complied with the MHPA provisions with an approximately three percent of surveyed plans that filed an MHPA increased cost exemption;

however, no plans completely excluded mental health benefits in response to the MHPA (United States General Accounting Office, 2000).

While official federal government study results showed excellent MHPA compliance for employer-sponsored health plan, the GAO also found an increase in more restrictive QTLs and cost-sharing provisions, possibly a consequence of insurers looking to offset increased costs. Of all surveyed plans, 87 percent of plans either imposed more restrictive QTLs or cost-sharing provisions, with 75 percent of those plans imposing more restrictive QTLs for mental health services (United States General Accounting Office, 2000).

Post-MHPA State-Level Parity Mandates

Widespread displeasure with MHPA provisions increased awareness of behavioral health parity as a health policy tool. Parity advocates and advocacy groups were dissatisfied with the content contained in the MHPA and looked towards state legislatures in passing more comprehensive state-level mandates. More than half of subsequent state mandates superseded the provisions in the MHPA through requiring parity in terms of QTLs, in addition to the annual and lifetime financial limits covered under MHPA provisions (Barry et al., 2010).

In 1999, President Clinton reinstituted behavioral health parity as part of the health insurance benefit package for all federal employees enrolled in the FEHB program effective in 2001. When reinstituting behavioral health parity, President Clinton also directed researchers to conduct a comprehensive parity evaluation on utilization measures, expenditures, and access to care for behavioral health services both before and after the parity law (Goldman et al., 2006).

Congress also spearheaded an effort to pass the Mental Health Equitable Treatment Act of 2001, which would parallel FEHB parity by expanding federal legislation to add parity provisions for QTLs. The law had similarities to the MHPA in that it also lacked a mandate to

require coverage of mental health benefits for health insurers, excluded substance use disorders, and held small employer and cost exemptions. Ultimately, this bill stalled in Congress and was never signed into law (Kennedy, 2001).

With the passage of the state-level behavioral health parity mandates, researchers began to refocus research towards the emerging managed care environment, an environment that employs cost control tools through a variety of avenues: behavioral health carve-out vendors, the establishment of specialty provider networks, and using other methods to manage the utilization of care (Barry et al., 2006). Using anecdotal evidence from companies with managed care tools in their plans, most of these plans saw small increases while others saw decreases in overall costs, effectively debunking the increased cost argument of mental health parity mandates (Frank et al., 2001). Researchers conducted quasi-experimental studies of the insurance plans found that managed care plans failed to detect increases in spending as a result of parity in addition to decrease in out-of-pocket expenditures for managed care beneficiaries (Barry et al., 2006).

Post-MHPA State-Level Parity Mandates: Michigan Mandates

The State of Michigan ratified two behavioral health parity mandates: one in 1998 that covered only substance use disorders and the other in 2001 that included both mental health and substance use disorders. The 1998 mandate applied to group insurance for inpatient services and extended the scope to individual insurance packages for all other modes of substance use disorder treatment. The 1998 substance use disorder mandate applied minimum annual benefits of \$1,500 for outpatient and rehabilitative substance use disorder treatment services. The minimum benefit for inpatient services was not specified in the mandate. In 2001, the annual limits were raise to \$2,968 and the law included no limit on inpatient visits. In addition, the 2001 mandate specified that copayments and coinsurance must be at parity for both mental health

services and substance use disorder services. Both mandates allowed insurance companies to petition for an increased cost exemption if insurance companies could show that the mandate increased premiums for beneficiaries by at least 3 percent (Robinson et al., 2007).

Post-MHPA State-Level Parity Mandates: Issues with Mandates

While state-level behavioral health parity laws were the most common form of parity, there are some drawbacks to the state-level mandates. Employer-sponsored insurance plans that are self-insured, meaning the company insures its own employees, are exempt from any state mandates due to provisions located in the Employee Retirement Income Security Act (ERISA). This immunity reduced the benefits subject to state parity provisions by half for those with employer-sponsored insurance, on average, due to the commonality of self-insured employersponsored plans in the United States group insurance market. By 2003, only one out of every five Americans had coverage for mental health services at parity. While the one in five figure did not account for increased cost exemptions, the authors believed those exemptions would have a negligible effect (Buchmueller et al., 2007).

In July 2002, the American Psychiatric Association declared that substance use disorders were diagnosable illnesses and condemned the exclusion of substance use disorders from insurance policies, including from state-level parity laws. Greenfield (2005) believed that there were two reasons driving the exclusion of substance use disorders: lack of effective treatments and concerns about cost. The argument of lack of effective treatments for substance use disorders was debunked as both high rates of treatment success and the biological connection of substance use disorders had been discovered and highly cited amongst professionals. Any concerns about the added cost of substance use disorder treatment could be mitigated by implementing substance

use disorder parity in a managed care setting, where negligible cost increases had been previously found.

The Mental Health Parity and Addiction Equity Act

The Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008 expanded provisions included in the previous MHPA. Enacted with no sunset date, the MHPAEA explicitly prohibits health insurance plans, including self-insured plans exempt from state-level mandates, from setting more stringent provisions for behavioral health services than for physical medical and surgical services. With many states already employing their own mandate, the MHPAEA will not preempt those legislations unless the state-level mandate interferes with the application of MHPAEA provisions. The original statutory provisions for the MHPEA were effective for plan years after October 3rd, 2009, supplemented by the Interim Final Rules (IFR) for plans after July 1st, 2010 in addition to the Final Rules for plans after January 1st, 2014. The federal government classified behavioral health parity into six classifications of benefits covered by the MHPAEA provisions: in-network inpatient, out-of-network inpatient, in-network outpatient, out-of-network outpatient, emergency care and prescription drugs. In addition to the classic parity provisions of QTLs, cost sharing, and financial limits, the MHPAEA also includes provisions for non-quantitative treatment limitations (NQTLs). Although the identification of NQTLs can be difficult, the classic example is prior authorization, a medical management technique commonly seen in managed care contracts (Federal Register, 2013).

Similar to previous legislations, the MHPAEA did not explicitly require insurers to cover behavioral health benefits (Federal Register, 2013). At the time of the MHPEA, almost all group plans already covered inpatient behavioral health benefits. Of all surveyed group plans, 85 percent of plans covered outpatient mental health services. In addition, 78 and 79 percent

covered inpatient and outpatient substance use disorder rehabilitation benefits, respectively (Bureau of Labor Statistics, 2011).

Like almost all other state and federal mandates, the MHPEA includes exemptions for both small employers as well as for insurers who claim an increased cost burden. Employers who employ less than 50 employees are exempt from MHPAEA provisions, despite the Affordable Care Act definition of a small employer as an employer with fewer than 100 employees. Health insurance companies who claim a two percent or greater increase in overall costs during the first year of MHPAEA implementations are exempt from the provisions after filing and receiving acceptance for their increased cost exemption. After the first year, health insurance plans that experience a one percent or greater increase in overall costs can also apply for an increased cost exemption. While there is a cost exemption for insurers, the official federal government report on the Final Rules noted that no insurers applied for cost exemptions due to the Interim Final Rules

The Final Rule of the MHPAEA extended parity provisions to individual and small group plans, included due to provisions in the final rule for the Essential Health Benefits (EHB) package. Terms included in the EHB final rule apply the provisions of the MHPAEA to grandfathered and non-grandfathered individual and small group insurance plans. Provisions in the EHB final rule are applicable to plans purchased either on the healthcare exchange or through other insurance markets (Federal Register, 2013).

Health insurance companies and employers both held steadfast reservations regarding the new federal mandate. Employers expressed concern that the MHPAEA would lead to the passage of subsequent health insurance mandates forced on businesses. Employers also desired a uniform law, in the sense that large corporations struggled with different provisions in different states due to the heterogeneous state mandates. Health insurance companies expressed displeasure with

previous federal mandates, especially with the FEHB parity provision that all diagnoses located in the Diagnostic and Statistical Manual (DSM) with a medically necessary reason were subject to parity provisions. Instead of repeating history, health insurers wanted to decide what diagnoses were included in the parity law in order to assist with the management of care to keep cost increases at a minimum (Barry et al., 2010).

In addition to research showing cost containment in a managed care environment, personal experiences of Congresspersons with behavioral health disorders and political compromise helped to get the MHPAEA to pass through Congress. Various Congresspersons testified about their personal experiences with behavioral health disorders, which were pivotal in gaining support amongst their peers as well as allowing for the humanization of behavioral health disorders. In testimony, several Congresspersons testified that their behavioral health disorders were treated as "second-class illnesses". The Senate and House of Representatives drafted separate bills¹ in 2007, with both bills passing in their respective chamber. With both bills passing, compromise was needed in order to pass one common bill. After months of deliberation, a compromise was reached in June 2008, which allowed health plans to determine what diagnoses were covered by MHPAEA provisions (Barry et al., 2010); however, the GAO monitors for systematic exclusions and sends a report every other year to Congress (Cummings et al., 2013). Also, the compromise bill extended parity to out-of-network services and states were able to pass a more comprehensive mandate, if they wanted. Ultimately, the MHPAEA was placed into the financial services bailout bill in September 2008 as a rider to pass bailout provisions through both legislative Chambers (Barry et al., 2010).

¹ The Senate bill was The Mental Health Parity Act of 2007 while the House of Representatives passed The Paul Wellstone Mental Health and Addiction Equity Act of 2007.

While pharmaceuticals comprise one of the six aforementioned benefits covered under the MHPAEA, pharmaceuticals are not affected since behavioral health pharmaceuticals were already covered on parity with general medical pharmaceuticals long before the passage of the MHPAEA. In most insurance contracts, behavioral health pharmaceuticals are commonly placed in a portion of the contract that is interconnected with general medical and surgical benefits (Mark et al., 2012).

The Mental Health Parity and Addiction Equity Act: Ongoing Issues

Even after accepting their compromise bill, health insurers face hurdles when implementing the MHPAEA provisions. Behavioral health services typically deal with unique treatment settings compared to general medical and surgical settings. Constant discussion between insurers and governmental regulators is required in order for an insurer to apply the provisions to the unique treatment settings at a parity level. Compliance with provisions requires for health insurers to refile their contracts effectively with state regulators, while keeping an increase in administrative costs and time to a minimum. Also, in the case that an insurer uses a behavioral health carve-out vendor, the health insurer also needs to ensure that their vendor complies with all provisions in the mandate (Dixon, 2009).

Stigma, as defined by Cummings (2013), is a complex set of social and cognitive processes experienced by a person or their peers that afflicts a sufferer from mental illness. The MHPAEA is an antidiscrimination law for behavioral health sufferers for two reasons: the comprehensiveness of provisions in the law and complementary provisions in the Affordable Care Act. Despite the classification as an antidiscrimination law, stigma could limit MHPAEA provisions for some behavioral health sufferers. For example, a person with a serious mental

illness, despite the parity provisions, could experience a negative stigma and not attempt to seek treatment for their ailment.

Effective implementation of federal parity provisions requires the work of behavioral health service advocates to educate both consumers and employers about the benefits included in the federal parity mandate. Advocates should illustrate to consumers that treating behavioral health ailments influences both physical health as well as the wellbeing of a person. Employers will see productivity gains once employees with behavioral health problems seek treatment for their conditions. Both consumers and employers should receive education on the exacerbation of behavioral health conditions without timely treatment (Shern et al., 2009).

The Mental Health Parity and Addiction Equity Act: Impact and Compliance

In the publication of the Final Rules in 2013, the United States Federal Government declared that the benefits of the MHPAEA justify the added costs of the MHPAEA on insurers and employers. The cost to implement the Interim Final Rules was approximately \$27.8 million, mostly attributable to insurer compliance. In the individual market, the government estimated a \$98 per enrollee per year burden on behavioral health spending for individual market enrollees, with an additional \$87 per enrollee per year out-of-pocket burden. Using actuarial estimates, the federal government estimated a total individual market behavioral spending increase of \$189.9 million in 2012 with a five year behavioral health spending increase of \$1.13 billion by the end of 2017 (Federal Register, 2013).

Between 2001 and 2009, behavioral health spending increases show an average of a 0.2 percent growth rates in behavioral health costs per year; however, pharmaceuticals not affected by the federal mandate provisions contribute to the majority of the increase in costs. Using pre-MHPAEA data from 2008, two percent of employer plans had increases in overall health care

costs due to behavioral health services that may qualify those plans for increased cost exemptions. Simulations show that the MHPAEA would contribute to cost increases for most plans of less than one percent, even if dramatic increases in utilization for high utilization beneficiaries were seen (Mark et al., 2012).

The federal government commissioned the University of Chicago to conduct the official compliance study for the Interim Final Rules (IFR) published as Goperlud (2013) of insurance plans. Compliance with copayment and coinsurance prior to the MHPAEA varied by classification: excellent for emergency and pharmaceutical services, very good for inpatient services, and good for outpatient services. The biggest compliance issues were more restrictive in-network outpatient benefits and higher coinsurance rates for emergency and pharmaceuticals that were seen in some insurance contracts. After the IFR, all classifications experienced drops in noncompliance. After the implementation of the IFR, very few plans utilized separate deductibles for behavioral health services.

Prior to the passage of the federal mandate in 2008, most insurance plans already complied with parity in QTLs for behavioral health services. Day limits placed on substance use disorder services were the main compliance issues with QTLs before the MHPAEA. After the implementation of the IFR, almost all insurance plans complied with all classifications of quantitative treatment limitations.

Compliance with NQTLs fared worse than most other provisions. There were clear restrictions for NQTLs in 28 percent of surveyed plans. After the implementation of the IFR, approximately 8 percent of plans increased usage in managed care tools in response to the mandate. No insurance plans increase their benefits for medical or surgical services in an attempt to comply with MHPAEA provisions. Since the ACA does not mandate behavioral health

benefits for large group plans sponsored by employers, employers are still able to choose to offer behavioral health benefits (Beronio, 2014). Very few plans dropped their behavioral health benefits altogether in lieu of changing plan provisions to comply (Goperlud, 2013).

Patient Protection and Affordable Care Act

The PPACA extends behavioral health parity benefits to 11 million and 24.5 million in individual and small group health insurance markets, respectively, in addition to extending parity provisions to 25 million uninsured Americans who will receive some health insurance coverage, either through insurance exchanges or Medicaid expansion. To increase parity benefits in the small group and individual insurance markets, the EHB provisions extend MHPAEA benefits by placing behavioral health as one of ten benefit categories where insurers must mirror mandates and benefits for large group plans. Most states chose a large group plan as their benchmark plan due to the representativeness and compliance with existing insurance mandates. The EHB provisions are extending MHPAEA provisions to a broader audience of consumers of behavioral health services.

Individual market health insurance plans that are placed on health insurance exchanges are required to meet adequacy standards for terms of networks. For exchange plans, provider networks must be sufficient for both the number and types of providers that are offered within a provider network, with specific requirements for behavioral health providers in every network. As an additional protection, the MHPAEA treats the adequacy of behavioral health providers in a provider network as an NQTL.

A provision in the PPACA that extends dependent insurance coverage up to age 26 also has promise to improve behavioral health service utilization. This provision allows for possible improvements in access to care, as well as a shorter time from diagnosis to treatment. The

importance of this provision can stem from the adequate treatment of vulnerable young adult populations after a first time behavioral health diagnosis. The PPACA also requires that health insurers cover a specific-set of preventative services for beneficiaries. Behavioral health services for adults include depression screening in addition to screening and counseling for alcohol abuse (Beronio, Glied, & Frank, 2014).

Evaluation of Parity Mandates

Prior to the 2000 FEHB behavioral health parity mandate, few studies evaluated the impact of behavioral health parity laws. Of the early studies, these studies found no significant or a negligible effect on utilization, expenditures, and access to care for early state-level parity mandates (Bao & Sturm, 2004; Pacul & Sturm, 2000; Sturm, 2000). Later studies have been able to comprehensively evaluate parity laws and provide results on the effects of behavioral health parity legislation.

Evaluation of Parity Mandates: FEHB Parity

The Goldman et al. (2006) evaluation of FEHB behavioral health parity was the first assessment of a comprehensive behavioral health parity mandate. The government-sponsored study compared seven large FEHB parity plans with seven non-parity private insurance plans as controls. The study found that increases in utilization for behavioral health services were likely due to overall increases in utilization due to secular factors rather than due to the parity law. Six of seven parity plans showed that there was a significant reduction in out-of-pocket expenditure burden for behavioral health services beneficiaries. Finally, the authors attempted to quantify the quality of services using follow-up treatment for depression; however, inconclusive increases in follow-up treatment could be attributed to a secular trend or the parity mandate (Goldman et al., 2006).

Another study based off of FEHB parity analyzed substance use disorder services by pooling together the plans instead of keeping each plan separate by Azzone et al (2011). The pooled study found that increases in substance use disorder utilization were due to a secular trend; however, decreases in out-of-pocket expenditures for parity plans, when compared to control plans, were seen. The study also found that party improved diagnosis rates of substance use disorders; however, there were no improvements for parity on the initiation or engagement of substance use disorder treatment (Azzone et al., 2011).

In order to analyze the effects of FEHB parity on utilization and expenditure measures, another pooled study published by Busch et al. (2013) looked at three different mental health diagnosis: bipolar disorder, major depression disorder, and adjustment disorder. While total spending remained unchanged for bipolar disorder and major depression disorder after parity, total spending for adjustment disorder decreased. All three diagnoses showed a decrease in out-of-pocket expenditures; however, the decrease for adjustment disorder could be due to a decrease in overall spending. While the study found a significant decline in utilization of psychotherapy for adjustment disorder, there were no changes in utilization for bipolar disorder or major depressive disorder. In conclusion, the authors stated that more serious mental illness diagnoses saw no changes in utilization and expenditures, while reduced spending and utilization occurred for those with mental illnesses that are non-serious in nature (Busch et al., 2013).

Evaluation of Parity Mandates: National Evaluations of State-Level Parity Mandates

In one evaluation of state-level mandates, Dave et al. (2011) categorized all behavioral health parity mandates for substance use disorder services into three classifications: broad laws, limited laws, and low laws. There were observed increases in self-referrals and physicianreferrals for substance use disorder services in states with broad parity laws; however, there was

no effect of limited and low parity laws. When correcting for the endogeneity of parity laws through external substance abuse grant data and state population estimates, broad parity laws show some increase in the probability of receiving treatment; however, limited and low laws do not change the probability of receiving substance use disorder treatments. The authors classify the MHPAEA as a mandated-if-offered law, and do not find any difference between a mandated-if-offered and limited parity law, thus concluding that the MHPAEA will have little to no effect on treatment admissions or cost-sharing provisions for substance use disorder services (Dave et al., 2011).

In an evaluation of substance use disorder parity using facility-level information for facilities who treat substance use disorder services and accept private insurance, Wen et al. (2012) found full parity laws significantly improved the access to treatment, while parity-if-offered laws increased access to treatment to a lesser extent and partial parity laws had no effect on the access to treatment. The authors, like Dave (2011) considered the MHPAEA as a parity-if-offered law and predicted modest to no improvements for access to care. The study said that provisions for NQTLs in the MHPAEA could result in larger effects for the MHPAEA than for parity-if-offered state-level mandates (Wen et al., 2012).

Another national evaluation of parity laws utilized the K-6 evaluation scale in order to categorize the severity of mental illness into three groups: low, medium, and high mental distress in the Harris et al. (2006) study. The evaluation found that parity led to increases in utilization for low and medium distress groups; however, no changes in utilization were seen in the high distress group. Further, the evaluation determined that the majority of the increase in utilization stemmed from increases in the utilization of outpatient care, with some pharmaceutical contribution in the medium distress group (Harris et al., 2006).

The main focus of another national evaluation in state-level parity mandates related to how the passage of parity laws affected outpatient follow-up care for persons who had a recent psychiatric hospitalization published as Trevedi et al. (2008). The results, in general, suggested that states with parity for cost-sharing provisions saw a higher probability of a person receiving follow-up outpatient care. Also, the study found that follow-up utilization decreased for states that discontinued cost-sharing parity provisions in their mandates (Trevedi et al., 2008).

Evaluation of Parity Mandates: Evaluations of Individual State-Level Parity Mandates

The state-level Vermont behavioral health parity law passed in 1998 is comparable to the MHPAEA since the Vermont mandate includes provisions that are similar to the NQTL provisions in the MHPAEA (Federal Register, 2013). In the official SAMHSA-sponsored study by Rosenbach et al. (2003), the study analyzed two similar private insurance plans affected by parity provisions. There were observed increases in the use of managed care tools, such as prior authorization, used by the insurers to control costs after the implementation of the mandate. Further, there was an observed increase in outpatient mental health utilization and a decrease in substance use disorder following parity. The out-of-pocket expenses for behavioral health consumers enrolled in the two plans decreased, especially for beneficiaries with high levels of utilization for behavioral health services. In one of the two plans, overall spending increased, while overall spending decreased in the other plan. The decrease in overall spending for the one plan could be attributed to decreases in the utilization for substance use disorder services (Rosenbach et al., 2003).

The Oregon behavioral health parity mandated also contained NQTL provisions making the law a somewhat good comparison to the MHPAEA (Federal Register, 2013). An evaluation compared five managed care parity plans with respective non-parity controls, much like the

evaluations of FEHB parity and was published as McConnell et al. (2012). The use of managed care tools decreased after parity, a departure from the normal situation where insurers implement more managed care tools following the passage of a parity mandate. While overall spending for alcohol services increased, there was a nonsignificant decrease in overall spending for substance use disorder services. Small albeit insignificant increases in the out-of-pocket burden for alcohol and substance use disorder services differed from the normal decline in out-of-pocket burden seen after the passage of a parity mandate. The separation of substance use disorder and alcohol services are important, according to the authors, as there are changes in utilization and expenditure measures when the two diagnoses are separated versus being pooled together (McConnell et al., 2012).

The effect of the Oregon parity mandate on follow-up utilization was also analyzed by Wallace et al. (2013). There were observed significant increases in follow-up utilization after the passage of the parity law. The follow-up rates for beneficiaries with high utilization were lower than beneficiaries with moderate utilization; however. The results suggested that the influence of parity on follow-up measures was related to quantitative and nonquantitative factors rather than being exclusively related to cost-sharing provisions (Wallace et al., 2013).

In an evaluation of structured interviews after the implementation of the California parity law, Rosenbach et al. (2009) compiled the opinions of persons and organizations affected by the provisions of the mandate. Of the six interviewed health insurance plans, four plans continued to manage their own behavioral health benefits while the two other insurance plans contracted behavioral health benefits to a Managed Behavioral Healthcare Organization (MBHO)². After passing the mandate, insurance plans increased use of managed care tools, despite actuaries not

² A managed behavioral health care organization (MBHO), a behavioral health carve-out, and a carve-out are interchangeable terms meaning the same third-party vendor working on behalf of an insurer to manage care in the behavioral health sector.

believing that the mandate would increase overall insurance premiums. At first, California maintained little government oversight of the law; however, oversight increased after a few years due to widespread issues with access to care and insurers using managed care tools liberally. Health plan executives did not believe that limiting diagnoses made parity more affordable for insurance companies; however, mental health providers voiced concerns that the arbitrary diagnosis exclusions led to physicians changing the severity of illness on paper to insure their client would receive parity-level coverage (Rosenbach et al. 2009).

Issues in Behavioral Health

There are many special issues and challenges related to the behavioral health field. Some of these challenges can introduce complications into parity mandates. The two main issues in the behavioral health field are access to care and unmet need for care.

Issues in Behavioral Health: Access to Care

Widespread access to care problems in the behavioral health sector have been welldocumented in both academic and government publications, including Barry et al. (2008), Cunningham et al. (2009) and Oziransky et al. (2011). Many publications express concerns that managed care organizations prevent new behavioral health patients from receiving needed treatment. Barry et al. (2008) examined the barriers to behavioral health service treatment for managed care beneficiaries. Psychologists and psychiatrists had significantly lower odds of accepting Health Maintenance Organization (HMO) patients, compared to social workers. Further, professionals treating both children and adults had higher odds of accepting new patients than professionals who specialized exclusively in children or adults. Approximately 62 percent of behavioral health practices who could not accept new patients were unable to accept new patients due to an already full schedule. Other reasons for not accepting new HMO patients

included inadequate reimbursement rates (6 percent), complex administrative practices to enroll new patients (10 percent) and other reasons that included increased use in managed care tools (10 percent). Further, the study found that 17 percent of the listings for mental health providers in a list provided by the insurer were grossly inaccurate (Barry et al., 2008).

In a survey of primary care physicians, Cunningham (2009) found over two-thirds of the surveyed physicians indicated roadblocks in the referral of their patients to specialty mental health providers. Over half of the surveyed physicians have experienced barriers in the health insurance contracts of their patients that lead to difficulties in the mental health referral process. When analyzing the impact of state-level behavioral health parity mandates on denied referrals, states with parity mandates typically saw lower rates of denied referrals due to fewer barriers in insurance plans or less inadequacies in the coverage included in an insurance plans.

Another major issue with access to care is whether beneficiaries enrolled in plans subject to parity laws are actually aware of their benefits was highlighted by Oziransky et al. (2011). This issue is important as observed reductions in out-of-pocket spending found after many statelevel parity laws could be biased since the reductions only apply to beneficiaries with knowledge of their parity benefits. After New York ratified a mandate, one evaluation conducted structured interviews of consumers to ascertain consumer knowledge of the mandate. Nearly 50 percent of surveyed consumers were unaware of their benefits under the law, even for those who used inpatient parity benefits prior to their interview. Phone representatives for insurance companies were not aware of the law or were able to provide little meaningful information about the law. Written notices drafted by insurance companies for beneficiaries were not provided or provided inadequate descriptions of the mandate and its benefits. Some consumers in New York had difficulties searching for a high-quality mental health provider. Finally, consumers were

concerned about incomplete and outdate information provided on a provider network list (Oziransky et al., 2011).

Issues in Behavioral Health: Unmet Need for Care

Unmet need is a very important concern since MHPAEA and PPACA provisions could exacerbate problems in unmet need due to possible increases in the utilization for behavioral health services as a result of the increase in those covered under parity mandates. The unmet need for mental health services nearly double between 1997 and 2011, with further increases expected (Roll et al., 2013). Disparities in unmet need include a higher unmet need for children and adults compared to seniors, women compared to men, whites compared to nonwhites and Latinos, lower incomes compared to higher incomes, poor general health compared to good general health, and those with limitations in activities of daily living compared to those without limitations in activities in daily living. These differences in disparities both hold in crosssectional as well as longitudinal datasets (Roll et al., 2013).

Related to unmet need for care, there is a lack of qualified behavioral health professionals as discussed in Mechanic (2014). In recent years, few medical students are interested in psychiatry, confirming the stigma that psychiatry is an unpopular specialty in United States medical schools. Currently, many behavioral health providers employ case managers with little academic or professional training, even though these case managers must treat those with serious mental illnesses. To improve the current workforce mix in behavioral health services, the behavioral health workforce must be looked at, with current workers inadequately trained in evidence-based practices and treating patients with serious mental illnesses.

Issues in Behavioral Health: Miscellaneous Issues

Substance use disorder services are traditionally treated in specialty settings that are unique to substance use disorders and do not mirror the larger, mainstream health care system. Most substance use disorder treatment centers are small and operated by nonprofit or governmental entities. Most centers lack the streamlined financing and administrative processes seen in mainstream health care facilities. For the insured subject to parity, finding treatment centers can be difficult with 40 percent of facilities operated by nonprofits not accepting any forms of private insurance or Medicaid. Also, 50 percent of nonprofit facilities have no contracts with managed care organizations in order to be included in a preferred network of treatment providers, making seeking treatment difficult (Buck, 2011).

The behavioral health sector has seen constant increases in behavioral health pharmaceuticals. Many individuals are using pharmaceuticals in lieu of utilization of psychotherapy or evidence-based treatments. While increasing dependence on pharmaceuticals is not evil in itself, more evidence shows that more than half of behavioral health services are used by persons who do not meet diagnostic criteria for the condition that the pharmaceuticals are used for (Mechanic, 2014).

RESEARCH QUESTIONS

Specific Aim 1

The first specific aim is to assess the effect of state-level SUD parity mandate on the rate of SUD treatment admissions and the odds of paying primarily out-of-pocket. There has been considerable previous research done on the assessment of state-level SUD parity laws on SUD treatment admissions. Specifically, previous research has discovered differential impacts of state-level SUD mandates depending on the strength of the mandate. For mandates that impose a combination of QTLs and cost-sharing arrangements not at parity levels, both Wen et al. (2012) and Dave et al. (2011) find that states with these weaker state-level mandates have statistically insignificant increases in SUD treatment admissions. For mandates where QTLs and cost-sharing arrangements are at parity levels, Wen et al. (2012) and Dave et al. (2011) were able to conclude that these more comprehensive state-level mandates tend to significantly increase SUD treatment admissions.

We will follow Wen et al. (2012) and Dave et al. (2011), with modification, including the extension of the analysis for psychiatric comorbidities. Psychiatric comorbidities are a possible confounder of the relationship between a SUD parity mandate and treatment admission and expenditure outcomes. With the options for expanded treatment with the passage of a parity mandate, persons with psychiatric comorbidities could be more willing to receive SUD treatment at a mental health facility than at a specialty SUD treatment facility that reports information to the Treatment Episode Data Set – Admissions (TEDS-A) dataset. Buck (2011) highlighted that many specialty SUD treatment centers do not accept some forms of private insurance in some situations. Therefore, private insurance beneficiaries who have a psychiatric comorbidity may

seek treatment at a mental health facility instead of dealing with the hassle of having a SUD treatment facility accept their private insurance.

After an exhaustive search of behavioral health parity studies in both academic and governmental sources, we found no studies focusing on the odds of a private insurance admission for SUD treatment services primarily paid out of the pocket of a privately insured beneficiary. McConnell et al. (2012) found that substance abuse disorder out-of-pocket expenses increased, albeit insignificantly; however Goldman et al. (2006) and Azzone et al. (2011) have shown that out of-pocket expenditures decrease after the implementation of a comprehensive SUD parity mandate.

Specific Aim 2

The second specific aim is the assessment of the effect of the MHPAEA mandate on the number of SUD treatment admissions and the odds of paying primarily out-of-pocket. Wen et al. (2012) and Dave et al. (2011) both hypothesize that the MHPAEA will increase SUD treatment admissions; however, the increase would likely be insignificant, much like the impact of weaker parity laws. These studies point to the caveat that MHPAEA provisions apply only to private insurance plans that offer behavioral health benefits as the reasoning for the limited impact of the MHPAEA.

Further analysis by checking the effect between those with and without psychiatric comorbidities is also used in order to check possible differences in the odds of using out-of-pocket expenditures as the primary funding source. The rationale behind separating these two groups is highlighted above in Specific Aim 1.

Hypotheses

The main goal is to assess the impact of state-level parity mandates in addition to the MHPAEA on SUD treatment admission rates and the odds of paying primarily out-of-pocket as for SUD treatment.

With the TEDS-A dataset, weaker state-level parity mandates will have insignificant increases in treatment admissions. This hypothesis is based off evidence presented in Wen et al. (2012) and Dave et al. (2011). Unlike equal state-level parity mandates, equal state-level parity mandates will see significant increases in the rate of SUD treatment admissions.

With the weaker state-level behavioral health parity mandates, it is anticipated that the odds of a private insurance admission paid primarily out-of-pocket payment as the primary source for SUD treatment costs will be higher than if no state-level parity mandate has been ratified by a state legislature. This is primarily due to a report published by the US GAO (2000) that states that insurers typically respond to minimum benefits by increasing cost control provisions through QTLs or cost-sharing arrangements. In comparison, more comprehensive state-level behavioral health parity mandates will have an insignificant effect on such since the parity-like provisions will only affect those with the highest use of SUD services.

While Wen et al. (2012) and Dave et al. (2011) both speculated small, likely statistically insignificant increases for the effect of the MHPAEA on SUD treatment admissions, their conclusions should be interpreted with caution because these studies assumed that the proportion of insurance plans that offer behavioral health benefits are lower than the actual proportion of plans that do offer benefits. In addition, state-level mandates exempt self-insured plans from the mandate, while the MHPAEA includes self-insured plans. The BLS (2011) reports that an overwhelming majority of private insurance plans offer behavioral health benefits that are

subject to the parity provisions. Evidence from the BLS numbers as well as NQTL provisions lead us to anticipate that the TEDS-A data will show that the MHPEA will have a larger effect on SUD treatment admissions than both comprehensive and weaker state-level behavioral health parity mandates. Finally, we hypothesize that the odds of out-of-pocket payment as the primary source for SUD admissions will be significantly reduced after the implementation of the MHPAEA due to the expanded NQTL parity provisions, reducing the extent of managed care tools that are applied unequally to behavioral health services.

MATERIALS AND METHODS

Dataset

The dataset that is analyzed for this thesis is the Treatment Episode Data Set – Admissions (TEDS-A), a non-random sample of substance abuse treatment admissions between 1992 and 2012 reported in state administrative data systems. Currently, there are five waves of multiple years of treatment admission data that have been released and the fifth wave will continue through 2014. The dataset used for analysis is the 19-item Minimum Data Set in addition to the 15-item Supplemental Data Set in order to obtain all covariates of interest. The data are publicly available for download by researchers through the website of the Interuniversity Consortium for Political and Social Research (ICPSR).

TEDS-A is a subset, not a census, of treatment admissions for substance use disorders in the United States. The TEDS-A data system requests all substance use disorder treatment admissions to facilities receiving some form of public funding; however, TEDS-A cannot guarantee that all treatment centers that receive public funds are included in the dataset. Some purely private funded treatment facilities also report their admissions; however, the extent of these private treatment center data is unknown by the ICPSR. States report the admission data to TEDS-A; therefore, reporting differences can differ by states and years depending on individual and intricate state reporting policies (SAMHDA, 2012). Dave et al. (2011) reported that the TEDS-A admissions tend to be of lower-income and lower-education populations and the sample is not representative of the overall substance use disorder population. Admissions from private insurance individuals who tend to be lower-income and lower-educated is beneficial for the specific aims of this thesis because lower-income and lower-educated private insurance

beneficiaries who have less comprehensive private insurance plans will benefit more from the effects of parity laws and the provisions included in the PPACA.

Beginning in 2000, the ICPSR extended the TEDS-A dataset and began collecting supplementary discharge information located in the Treatment Episode Data Set – Discharges (TEDS-D). This dataset was not analyzed for this thesis since there are no additional information in the dataset to help answer the specific aims of this thesis.

External Data

External data publicly available on federal government websites were merged to the TEDS-A data as needed. Population estimates at both the state and county level were obtained through the population estimates tables provided at the website of the United States Census Bureau (United States Census Bureau, 2015). For Specific Aim 1, total state populations for each year were added to the model as an offset in order to get a substance abuse treatment admission rate. For Specific Aim 2, state populations were added to the model for each year as a covariate to control in the model.

For the MHPAEA models, the percentage of private and public health insurance beneficiaries in each state and year was obtained from the Current Population Survey Social and Economic Supplement (CPS ASEC) from 2008 to 2012 (United States Census Bureau, 2015). These data were merged with the TEDS-A data in order to see if changes in the percentages of private and public insurance impact parity. We speculate that the recession changed the makeup of insurance, as many unemployed workers lost private insurance coverage and subsequently gained public insurance coverage through Medicare or Medicaid.

Target Population

For state-level mandates, the analysis focuses on all privately insured SUD treatment admissions for persons under 50 years of age recorded in the TEDS-A dataset between 1992 and 2012. The choice of only the privately insured is in disagreement with Dave et al. (2011) using all treatment admissions; however, state-level parity mandates typically apply to only private insurance beneficiaries.

For our evaluation of the MHPAEA, all privately insured SUD treatment admissions between 2008 and 2012 in a state without a state-level SUD parity mandate are used; however, there is a comparison group of all Medicaid insured SUD treatment admissions in order to evaluate the effect of the MHPAEA. The Medicaid population is chosen as a comparison group since MHPAEA provisions have not yet been extended to the Medicaid population. While the PPACA required Medicaid beneficiaries to have coverage of behavioral health services, this requirement began in 2014 and our data only go up to 2012 (Beronio, 2014).

The analyses of the state-level mandates as well as the MHPAEA restrict the age range for treatment admissions to persons of less than 50 years of age. This restriction is necessary since the TEDS-A dataset is unable to accurately define those with Medicare coverage for the MHPAEA analysis. TEDS-A groups Medicare with other types of governmental insurance such as military insurance. The population will also be age-restricted at 50 years because we want to be able to directly compare the effects of the two specific aims.

Historically, studies on the effects of parity mandates have aggregated alcohol and other substance treatment services together in order to study the effects of parity mandates. In the McConnell et al. (2012) study of the Oregon parity mandate, they separated alcohol and other substance treatment services and found differential effects for alcohol and other substances.

Therefore, three categorizations of substances abused are created for this analysis: alcohol treatment services, substance abuse admissions, and co-occurring alcohol and substance abuse admissions.

Previous behavioral health parity studies have also generally neglected to separate the effect of parity by treatment category, which could also confound the effect of parity mandates on utilization and expenditures. Our analysis has been subset into three different treatment categories for each categorization of substance abuse as defined in the TEDS-A dataset: Inpatient Detoxification, Inpatient Rehabilitation, and Ambulatory Treatment. Inpatient Detoxification includes admissions to comprehensive inpatient acute detoxification services that are provided in a hospital or non-hospital setting, with the goal of achieving cessation from an addiction that could cause imminent physical or mental harm. Inpatient Rehabilitation services are services provided in either a hospital or non-hospital setting for short-term or long-term treatment focused on 24 hour per day services for rehabilitation from an addiction. Finally, Ambulatory Treatments are outpatient rehabilitation services that may include therapies, evidence-based, or pharmaceutical therapies.

In the TEDS-A dataset, ten states do not report the insurance status for SUD admissions every year between 1992 and 2012 and the states are therefore excluded from the analysis³ Dave et al. (2011) addressed this situation and reported no significant differences in SUD parity mandates between the forty states that report insurance status every year and the ten states that are excluded due to problems in reporting insurance status every year. In addition, SUD

³ The 10 states as reported by Dave et al. (2011) are California (no mandate), Connecticut (equal mandate), Indiana (equal mandate), Massachusetts (equal mandate), Michigan (unequal mandate), Minnesota (no mandate), New York (unequal mandate), Oregon (equal mandate), Tennessee (no mandate), Washington (no mandate), and Wisconsin (no mandate)
admissions in the District of Columbia and Puerto Rico were excluded since there is unclear and conflicting information on the parity situation in either territory.

Defining Parity Mandates

Detailed information on the scope of all state-level behavioral health parity mandates that were passed prior to 2007 was obtained through an official publication provided by the Substance Abuse and Mental Health Services Administration (SAMHSA) (Robinson et al., 2007). Since some state mandates were passed after 2007 but prior to the 2010 implementation of the MHPAEA, those state-level mandates were identified using the National Council of State Legislatures website (National Council of State Legislatures, 2015). In order to ensure the accuracy of the provisions of state-level behavioral health parity mandates as reported by SAMHSA and the NCSL, all parity mandates were double checked through compiling and reading the state legislative code for each individual mandate⁴.

For all 50 states, SAMHSA identified 71 mental health parity mandates, 46 substance use disorder parity mandates, and 15 alcoholism only parity mandates prior to 2007. After 2000, almost all mandates included language for both mental health and substance use disorder services. After 2007, the NCSL identified an additional 9 mental health state parity mandates as well as 2 substance use disorder parity mandates. In choosing parity laws that are applicable to each state, 19 state-level mental health parity mandates in addition to 12 state-level substance use disorder parity mandates, the mandates are only applicable to state employees or certain occupations, such as all public school employees in a given state. Other mandates were excluded if they included only court-ordered mental health and substance use disorder treatments to be offered at parity.

⁴ The website <u>http://law.justia.com/</u> provides a convenient place for all legislative code in the United States

Further, the list of applicable parity mandates was reduced to mandates that included substance use disorder passed between the years of 1997 and 2009. The list was further reduced to include only the 40 states that include information for every year on private insurance status of substance use disorder admissions. The laws were classified into equal and unequal in order to reflect whether substance use disorder benefits had equal QTLs and cost-sharing provisions as physical medical and surgical benefits.

State	Year of Passage	Scope
Alaska	1997	Unequal
Arkansas	1997	Equal
Delaware	2001	Equal
Georgia	1998	Unequal
Kansas	1998	Unequal
Kentucky	2000	Equal
Louisiana	2009	Equal
Maine	2003	Equal
Missouri	1997	Unequal
Montana	1997	Unequal
Nevada	1997	Unequal
New Hampshire	2003	Equal
New Jersey	2002	Unequal
North Dakota	2003	Unequal
Rhode Island	2002	Equal
Vermont	1998	Equal
Virginia	1998	Unequal
Virginia	2000	Equal
Virginia	2004	Unequal
West Virginia	2002	Equal

 Table 1: Applicable State-Level Parity Mandates

From the table above, there are 18 states with 20 different substance abuse disorder parity mandates passed between 1997 and 2010. Of the 20 different substance abuse disorder parity mandates, there were 10 equal in scope as well as 10 mandates that were unequal in scope. There are 22 states included in the analysis that did not pass a state-level parity mandate between 1997 and 2010. Virginia is interesting because they passed an equal state-level mandate in 2000, after

ratifying a previous unequal state-level parity mandate in 1998. In 2004, Virginia further redacted the 2000 parity mandate and went back to the language in the 1998 Virginia parity mandate.

This unequal/equal classification on state-level parity mandates has never been explored before in the behavioral health parity literature, to the best of our knowledge. Prior classifications of state-level mandates in Dave et al. (2011) and McConnell et al. (2012) have relied on whether a mandate forced all private insurance plans to carry SUD benefits at parity. This type of classification is not of importance, especially for the MHPAEA impact, since an overwhelming majority of private insurance plans carry behavioral health benefits (Bureau of Labor Statistics, 2011).

The MHPAEA mandate is defined as privately insured substance use disorder treatment admissions occurring after 2010, which is the effective date of the MHPAEA statutory provisions. The comparison group, Medicaid, does not yet have MHPAEA provisions in effect. Much like the heterogeneous state-level parity mandates, behavioral health provisions in Medicaid plans vary state by state, as they are set by each individual state legislature (Centers for Medicare and Medicaid Services, 2013).

Covariates

There are several demographic covariates that are controlled for in order to reduce the bias of the estimates in the analysis. Age is a categorical variable coded by SAMHDA as ages 12-17 (reference group), 18-29, 30-39, and 40-49. Gender is coded as an indicator variable with female as the referent and male as the only other gender coded.

Race and ethnicity are coded separately in the TEDS-A dataset. Race was recoded to include three categories: white (reference group), black, and all other races aggregated together.

Ethnicity has been recoded as not Hispanic (reference group) and of Hispanic origin. The rationale behind recoding is that small groups with very few admissions were recoded into larger groups. For example, TEDS-A originally codes the ethnicity variable to indicate the region of Hispanic origin (SAMHDA, 2012).

Education is also coded as a categorical variable in the TEDS-A dataset. The categories of education are less than high school (reference group), high school graduate, some college, and college graduate. TEDS-A does not separate college graduates, which means that persons with associates, bachelors, and advanced degrees are lumped together in one educational category.

Psychiatric comorbidities were also controlled for in all models. When the unit of analysis is state-year, the proportion of admissions with psychiatric comorbidities was controlled for in the models. With the admission-level models, a psychiatric comorbidity is defined if that admission has a psychiatric comorbidity.

Identification Strategy

The final identification strategy for Specific Aim 1 was developed based off of the prior identification strategies implemented in previous state-level SUD parity mandate evaluations by Dave et al. (2011) and Wen et al. (2012). In addition, Harper et al. (2012) also explored the effect of medical marijuana mandates on marijuana utilization using the basic framework that will be expanded in this thesis. The identification strategy for Specific Aim 2 was similar to Meyer (1995) for implementing natural, or quasi, experiments in economics.

Identification Strategy: Specific Aim 1

For the utilization outcomes, which are measured as the rate of treatment admissions in a state for a given year, the differences-in-differences estimator was used with 2-way fixed effects for state and year. This model is implemented using a generalized linear model that has a

negative binomial distribution with a log link as well as a mean dispersion parameter. This variation of the generalized linear model is commonly referred to in the statistical literature as the NB-2 model (Hilbe, 2011). The model is given as follows:

$$\log\left(\frac{E[Y_{st}|x]}{population_{st}}\right) = \lambda_0 + \lambda_1 Unequal_{st} + \lambda_2 Equal_{st} + \gamma_t + \delta_s + z'_{st}\zeta$$
(1)

where the outcome is the rate of treatment admissions for state *s* during year *t*, *population_{st}* is the state-year population and it is an offset in the model, $Unequal_{st}$ is a discrete variable that indicates if an unequal state-level parity mandate is in effect during year *t* in state *s*, $Equal_{st}$ is a discrete variable that indicates if an equal state-level parity mandate is in effect during year *t* in state *s*, γ_t is the fixed effect for each year *t*, δ_s is the fixed effect for state *s*, and z'_{st} is a vector of summary demographic covariates for treatment admissions in state *s* during year *t*.

The above model has been extended to a differences-in-differences-in-differences model to check difference in treatment admissions between those with psychiatric comorbidities and those without psychiatric comorbidities. The notation for this extended NB-2 model is as follows:

$$\log\left(\frac{E[Y_{st}|x]}{population_{st}}\right)$$

$$= \lambda_0 + \lambda_1 Psych_{st} + \lambda_2 Unequal_{st} + \lambda_3 Equal_{st} + \lambda_4 (Psych * Unequal)_{st}$$

$$+ \lambda_5 (Psych * Equal)_{st} + \gamma_t + \delta_s + z'_{st}\zeta$$
(2)

where the outcome is the rate of treatment admissions for state *s* during year *t*, *population_{st}* is the state-year population and it is an offset in the model, $Psych_{st}$ is the proportion of SUD treatment admissions with a psychiatric comorbidity for state *s* during year *t*, , *Unequal_{st}* is a discrete variable that indicates if an unequal state-level parity mandate is in effect during year *t* in state *s*, *Equal_{st}* is a discrete variable that indicates if an equal state-level parity mandate is in effect during year t in state s, $(Psych * Unequal)_{st}$ is the interaction between the proportion of SUD admissions with a psychiatric comorbidity and if an unequal state-level parity mandate was in effect, $(Psych * Equall)_{st}$ is the interaction between the proportion of SUD admissions with a psychiatric comorbidity and if an equal state-level parity mandate was in effect, γ_t is the fixed effect for each year t, δ_s is the fixed effect for each state s, and z'_{st} is a vector of summary demographic covariates for treatment admissions in state s during year t.

For the probability that a private insurance substance abuse treatment admission was primarily paid out-of-pocket, another difference-in-differences estimator with 2-way fixed effects for state and year was also employed. This model is a generalized linear model for a binomial distribution with a logit link function that models the odds of out-of-pocket payment as the primary payment for treatment. Unlike the utilization estimator that uses state-year level, this expenditures model uses data at the individual-level. The notation for this identification strategy is as follows:

$$logit(\Pr[OOP = 1]) = \beta_0 + \beta_1 Unequal_{ist} + \beta_2 Equal_{ist} + \gamma_t + \delta_s + z'_{ist}\zeta$$
(3)

where *OOP* is 1 if a private insurance beneficiary primarily pays out-of-pocket for treatment and *OOP* is 0 if a private insurance beneficiary primarily pays through insurance or some other form of payment, *Unequal*_{ist} indicates if an unequal state-level parity mandate is in effect for admission *i* residing in state *s* during year *t*, *Equal*_{ist} indicates if an unequal state-level parity mandate is in effect for admission *i* residing in state *s* during in state *s* during year *t*, γ_t is the fixed effect for each year *t* for each year *t*, δ_s is the fixed effect for each state, and z'_{ist} is a vector of individual specific demographic covariates.

The above logistic model in equation (3) has been extended just like equation (2). This extension of the logistic model allows for the estimation of the effect of parity laws on paying

out-of-pocket for private insurance beneficiaries when controlling for co-occurring mental disorder admissions. The notation for the extended logistic model is as follows:

$$logit(Pr[OOP = 1]) = \beta_0 + \beta_1 Psych_{ist} + \beta_2 Unequal_{ist} + \beta_3 Equal_{ist} + \beta_4 (Psych * Unequal)_{ist} + \beta_5 (Psych * Equal)_{ist} + \gamma_t + \delta_s + z'_{ist}\zeta$$
(4)

where *OOP* is 1 if a private insurance beneficiary primarily pays out-of-pocket for treatment and *OOP* is 0 if a private insurance beneficiary primarily pays through insurance or some other form of payment, $Psych_{ist}$ indicates if admission *i* had a substance use disorder admission with a co-occurring psychiatric condition, $Unequal_{ist}$ indicates if an unequal state-level parity mandate is in effect for admission *i* residing in state *s* during year *t*, $Equal_{ist}$ indicates if an unequal state-level parity mandate is in effect for admission *i* residing in state *s* during in state *s* during year *t*, (Psych * Unequalist is the interaction between if individual*i* $has a co-occurring psychiatric condition and if an unequal state-level parity mandate is in effect, <math>(Psych * Equal)_{ist}$ is the interaction between if individual *i* has a co-occurring psychiatric condition and if an unequal state-level parity mandate is in effect, r_t is the fixed effect for each year *t*, δ_s is the fixed effect for each state *s*, and z'_{ist} is a vector of individual-specific demographic covariates.

Identification Strategy: Specific Aim 2

For the utilization outcome, which is measured as the number of treatment admissions, the classic differences-in-differences estimator was employed. Again, for the DD estimator, an NB-2 model is chosen for modeling treatment admissions:

$$\log\left(\frac{E[Y_{st}|x]}{population_{st}}\right)$$
$$= \lambda_0 + \lambda_1 Private_{st} + \lambda_2 MHPAEA_t + \lambda_3 (Private * MHPAEA)_{st} + \delta_s + z'_{st}\zeta$$
(5)

where the outcome is the rate of treatment admissions in state *s* during year *t*, *Private* is the proportion of SUD treatment admissions in the TEDS-A sample, *MHPAEA* is an indicator that

indicates whether the MHPAEA is in effect, (*Private* * *MHPAEA*) is the interaction between the two terms and is the interaction of interest, δ_s is a fixed effect for state *s*, and z'_{st} is a vector of summary demographic covariates for state *s* during year *t*.

The above treatment admissions model has also been extended to a modified model. This difference-in-differences-in-differences extension allows for the examination of the effect of the MHPAEA for those with and without psychiatric comorbidities. The notation for the extended model is as follows:

$$\log\left(\frac{E[Y_{st}|x]}{population_{st}}\right)$$

$$= \lambda_1 Private_{ist} + \lambda_2 MHPAEA_t + \lambda_3 Psych_{ist} + \lambda_4 (Private * Psych)_{ist}$$

$$+ \lambda_5 (MHPAEA * Psych)_{ist} + \lambda_6 (Private * MHPAEA)_{ist}$$

$$+ \lambda_7 (Private * MHPAEA * Psych)_{ist} + \delta_s + z'_{ist}\zeta$$
(6)

where the outcome is the rate of treatment admissions in state *s* during year *t*, *Private* is 1 if the admission is privately insured and 0 if the admission is insured through Medicaid, *MHPAEA* is an indicator that indicates whether the MHPAEA is in effect, λ_4 through λ_6 are two-way interaction terms, λ_7 is the three way interaction, δ_s is a fixed effect for state *s*, and z'_{st} is a vector of summary demographic covariates for state *s* during year *t*.

For the odds that a private insurance SUD treatment admission was primarily paid out-ofpocket, a difference-in-differences estimator was employed. This model is a generalized linear model for a binomial distribution with a logit link function. This model allows for the modeling of odds as primary payment source. Unlike the treatment admissions models as seen above, this model uses individual-level data. The notation for this strategy is as follows: $logit(Pr[OOP = 1]) = \beta_0 + \beta_1 Private + \beta_2 MHPAEA + \beta_3 (Private * MHPAEA) + \delta_s + z'_i \zeta$ (7) where the outcome is whether a person is paying primarily out-of-pocket for their treatment admission, *Private* denotes whether the individual has private insurance coverage or Medicaid, *MHPAEA* denotes whether or not the MHPAEA provisions apply to the private insurance population, (*Private* * *MHPAEA*) is the interaction between the two terms and is the interaction of interest, δ_s is a fixed effect for state *s*, and z'_{st} is a vector of summary demographic covariates for individual *i*.

The above expenditures model has also been extended to a modified model. This difference-in-differences-in-differences extension allows for the examination of the effect of the MHPAEA for those with and without psychiatric comorbidities. The notation for the extended model is as follows:

$$logit(Pr[OOP = 1])$$

$$= \beta_0 + \beta_1 Private + \beta_2 MHPAEA + \beta_3 Psych + \beta_4 (Private * Psych)$$

$$+ \beta_5 (MHPAEA * Psych) + \beta_6 (Private * MHPAEA)$$

$$+ \beta_8 (Private * MHPAEA * Psych) + \delta_s + z'_i \zeta$$
(8)

where the outcome is whether or not an individual pays primarily out-of-pocket for treatment, *Private* refers to whether or not the individual had private insurance or Medicaid, *MHPAEA* is an indicator that indicates whether the MHPAEA was in effect, β_4 through β_6 denote interaction terms, β_7 is the three-way interaction, δ_s is a fixed effect for state *s*, and z'_i is a vector of covariates for individual *i*.

Statistical Methods

All analysis was performed using STATA, version 13 (StataCorp, 2013). The choice of the NB-2 model is preferable to all alterative modeling strategies for several reasons. While Ordinary Least Squares (OLS) could accurately model treatment admissions, count data models better preserve the unique features of count data, which are discrete and non-negative (Hilbe, 2011). In the treatment admissions models, the state population for each year was used as an offset, or exposure, as Dave et al. (2011) felt that the use of a population offset assists in controlling for unobserved differences in treatment admission rates between states. These unobserved differences in treatment admission rates between states have likely biased the results of previous behavioral health parity evaluations. The use of the offset cannot be used in OLS models, but can be used in both Poisson and Negative Binomial models.

While the Poisson model with a log link is an attractive option, the Poisson distribution has an assumption of no overdispersion, an assumption that is almost always violated in realworld data (Hilbe, 2011). We evaluated the equidispersion assumption using deviance and Pearson dispersion statistics that were deviance and Pearson statistics divided by the degrees of freedom. In the preliminary Poisson models, the equidispersion assumption was deemed to be strongly violated because the deviance and Pearson statistics, when divided by degrees of freedom, were much greater than their expected value of one.

Negative Binomial models are seen as a viable alternative to violations of the equidispersion assumption by using the dispersion parameter α to control for overdispersion. There are many variations in the Negative Binomial modeling; however, the Negative Binomial Regression with mean dispersion, or the NB-2 model, is almost always used in data analysis (Hilbe, 2011). Thus, the NB-2 model was chosen as the model for the rate of treatment admission analysis. In all of our models, α was significant, meaning that the data were overdispersed and that the NB-2 models helped to control for the overdispersion.

Binary logistic regression was chosen to model out-of-pocket outcomes because the logistic regression models binary data and the coefficients can easily be interpreted as odds ratios.

RESULTS

Descriptive Statistics

Table 2: Descriptive Statistics

_	Alcohol		Subs	Substance Abuse			Co-Occurring		
	No Parity	Unequal	Equal	No Parity	Unequal	Equal	No Parity	Unequal	Equal
Gender									
Female	24.43	27.31	28.19	33.89	34.65	34.98	25.65	25.20	26.23
Male	75.57	72.69	71.81	66.11	65.35	65.02	74.35	74.80	73.77
Age Category									
12-17	4.70	4.13	3.15	21.00	21.75	12.75	23.13	24.72	14.06
18-29	27.55	25.51	30.05	32.46	38.53	48.09	30.22	33.63	40.66
30-39	35.22	31.28	28.87	28.06	22.28	23.15	29.82	22.15	24.03
40-49	32.54	39.08	37.94	18.48	17.44	16.01	16.83	19.51	21.25
Race									
White	84.29	88.55	90.56	70.58	82.73	87.24	74.56	84.40	87.33
Black	8.53	5.61	3.86	23.13	13.46	5.37	17.90	9.90	7.43
Other	7.17	5.84	5.58	6.29	3.81	7.39	7.54	5.70	5.24
Education									
Less than High School	18.48	18.27	16.15	38.93	39.73	31.75	39.50	39.56	31.06
High School Graduate	44.77	44.53	41.96	38.92	38.32	43.37	38.45	37.10	40.99
Some College	23.07	23.32	24.45	16.41	16.55	19.33	16.34	17.20	20.35
College Graduate	13.68	13.88	17.44	5.74	5.40	5.55	5.71	6.15	7.60
Primary Payment Type									
Out-of-Pocket	23.33	12.74	12.37	12.47	17.13	10.97	11.33	10.97	13.83
Other	76.67	87.26	87.63	87.53	82.87	89.03	88.67	89.03	86.17
Psychiatric Comorbidity									
Yes	13.47	15.36	29.86	22.38	21.90	36.63	22.53	22.52	36.91
No	86.53	84.64	70.14	77.62	78.10	63.37	77.47	77.48	63.09

All results are expressed in terms of column percentages.

From the descriptive statistics listed above, there are a few demographic trends that are of note to mention. While these trends are controlled for in the regression models, we found these trends noteworthy to mention as they provide a glimpse into the effect of parity. Compared to substance abuse and co-occurring alcohol and substance abuse treatment admissions, alcohol treatment admissions tend to be for older populations. Very few 12 to 17 year olds have alcohol treatment admission and a sizeable proportion of alcohol treatment admissions are for persons aged 40 to 50.

The race and ethnicity of SUD treatment admissions changes depending on the parity mandate in effect, regardless of the substances related to admission. With both unequal and equal state-level parity mandates, a greater proportion of White and non-Hispanic treatment admissions occur, relative to states that do not have a state-level parity mandate in effect. In addition, alcohol treatment admissions are more likely to have higher education than do substance abuse or co-occurring admissions as evidenced by a greater proportion of alcohol treatment admissions that carry a college degree.

The next few pages show the change in treatment admission rates by state-level parity status over time.





Figure 1 shows the rate of alcohol treatment admissions by state-level parity mandate. In general, it appears that the treatment rate, per 100,000 residents, has shown somewhat of a decline over time. States with equal state-level parity mandates have consistently higher alcohol treatment admission rates, followed by states with no state-level parity mandates. States with unequal state-level parity mandates have a significantly reduced rate of treatment admission after 1997; however, the rate of alcohol treatment admission has increased over time. For those states that never passed a state-level parity mandate, the rate of alcohol treatment admissions has remained relatively stable since 1997.



Figure 2: Rate of Substance Abuse Treatment Admissions by State-Level Parity Mandate

Figure 2 depicts the substance abuse treatment rate, per 100,000 residents, over time for different parity status. Over time, it appears that there has been an increasing trend in substance abuse treatment rates for states that have passed state-level parity mandates. Recently, states with unequal state-level mandates have seen huge increases in the rate of treatment admissions. Between 1997 and 2002, the rate of treatment admissions expanded greatly for states with equal state-level parity mandates. After 1997, the rate of substance abuse treatment admissions has remained stable for states that have not passed a state-level parity mandate.



Figure 3: Rate of Co-Occurring Treatment Admissions by State-Level Parity Mandate

Figure 3 shows the trend of the rate of co-occurring treatment admissions, per 100,000 residents. States that have not yet passed a state-level parity mandate have seen a stable rate in co-occurring treatment admissions since 1997. For states with unequal parity mandates, there was a drop in the rate of co-occurring treatment admissions immediately following 1997. Over time, the rate of treatment admissions for states with unequal state-level mandates has once again reached pre-1997 levels. For states with equal state-level parity mandates, there was a spike in the rate of co-occurring treatment admissions between 1997 and 2002. This phenomenon was also noted in both alcohol and substance abuse admissions. Over time; however, the rate of co-occurring treatment admissions for states with equal state-level mandates has declined.

Regression Models

Regression Models: Specific Aim 1 Models

	Unequal State-Level Mandate			Equal State-Level Mandate		
	IRR	IRR (stand	dard error)	IRR	IRR (stand	dard error)
	(standard	No		(standard	No	
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity
Total Admissions	0.903	0.783	2.925	1.445	1.166	2.655
	(0.223)	(0.213)	(3.026)	(0.543)	(0.635)	(2.840)
State-Years	505	505		505	505	
(1/df) Deviance	1.136	1.140		1.136	1.140	
(1/df) Pearson	0.777	0.776		0.777	0.776	
-2 Log Likelihood	6783.665	6779.499		6783.665	6779.499	
Alpha	0.332	0.330		0.332	0.330	
Inpatient Detoxification	0.766	0.907	0.296 +	0.944	0.904	1.240
	(0.181)	(0.186)	(0.212)	(0.357)	(0.357)	(0.907)
State-Years	413	413		413	413	
(1/df) Deviance	1.126	1.134		1.126	1.134	
(1/df) Pearson	1.051	1.056		1.051	1.056	
-2 Log Likelihood	3954.949	3948.369		3954.949	3948.369	
Alpha	0.272	0.267		0.272	0.267	
Inpatient Rehabilitation	0.854	0.568	10.89***	1.438	1.867 +	0.509
	(0.352)	(0.274)	(6.587)	(0.582)	(0.607)	(0.232)
State-Years	435	435		435	435	
(1/df) Deviance	1.122	1.222		1.122	1.222	
(1/df) Pearson	0.960	0.957		0.960	0.957	
-2 Log Likelihood	3933.530	3912.108		3933.530	3912.108	
Alpha	0.365	0.347		0.365	0.347	
Ambulatory Treatment	0.977	0.959	1.132	1.528	1.288	2.213
	(0.222)	(0.228)	(1.307)	(0.645)	(0.773)	(2.527)
State-Years	502	502		502	502	
(1/df) Deviance	1.145	1.150		1.145	1.150	
(1/df) Pearson	0.760	0.761		0.760	0.761	
-2 Log Likelihood	6430.587	6429.209		6430.587	6429.209	
Alpha	0.346	0.346		0.346	0.346	

Table 3: Effect of State-Level Mandates on Alcohol Admissions

Coefficient is exponentiated; Cluster-robust standard errors(clustered by State) in parentheses

	Unequal State-Level Mandate			Equal State-Level Mandate			
	IRR	IRR (stand	lard Error)	IRR	IRR (stand	dard error)	
	(standard	No		(standard	No		
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity	
Total Admissions	0.926	0.864	1.635	1.621	0.951	5.736*	
	(0.199)	(0.182)	(2.488)	(0.693)	(0.438)	(4.074)	
State-Years	499	499		499	499		
(1/df) Deviance	1.137	1.140		1.137	1.140		
(1/df) Pearson	0.868	0.865		0.868	0.865		
-2 Log Likelihood	6204.116	6186.859		6204.116	6186.859		
Alpha	0.265	0.256		0.265	0.256		
Inpatient							
Detoxification	0.861	0.913	0.565	1.230	1.210	1.080	
	(0.231)	(0.274)	(0.818)	(0.640)	(0.713)	(0.598)	
State-Years	380	380		380	380		
(1/df) Deviance	1.130	1.130		1.130	1.130		
(1/df) Pearson	1.144	1.146		1.144	1.146		
-2 Log Likelihood	3437.504	3436.617		3437.504	3436.617		
Alpha	0.257	0.257		0.257	0.257		
Inpatient	0.001	0.072	0.600	1.260	1.226	1 000	
Rehabilitation	0.801	0.873	0.620	1.368	1.326	1.089	
	(0.296)	(0.249)	(0.636)	(0.3/1)	(0.393)	(0.717)	
State Veen	451	451		451	451		
State-Years	451	451		451	451		
(1/dI) Deviance	1.110	1.119		1.110	1.119		
(1/d1) Pearson	1.013	1.013		1.015	1.013		
-2 Log Likelinood	4147.127	4146.014		414/.12/	4146.014		
Alpha	0.268	0.207		0.208	0.267		
Ambulatory							
Treatment	0.913	1.062	0 429	1 989	1 189	5 123*	
Troutment	(0.190)	(0.300)	(0.752)	(0.847)	(0.567)	(3 563)	
	(0.190)	(0.500)	(0.752)	(0.047)	(0.507)	(3.303)	
State-Years	495	495		495	495		
(1/df) Deviance	1.143	1.147		1.143	1.147		
(1/df) Pearson	0.877	0.870		0.877	0.870		
-2 Log Likelihood	5827.670	5811.098		5827.670	5811.098		
Alpha	0.297	0.286		0.297	0.286		

Table 4: Effect of State-Level Mandates on Substance Abuse Admissions

 $\begin{array}{l} Coefficient \ is \ exponentiated; \ Cluster-robust \ standard \ errors(clustered \ by \ State) \ in \ parentheses \\ + \ p < 0.10 \qquad \ \ * \ \ p < 0.05 \qquad \ \ ** \ \ p < 0.01 \qquad \ \ *** \ \ p < 0.001 \end{array}$

	Unequal State-Level Mandate			Equal State-Level Mandate			
	IRR	IRR (stand	ard error)	IRR IRR (standard error)		ard error)	
	(standard	No		(standard	No		
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity	
Total Admissions	0.798	0.646*	3.568	1.489+	1.449	1.079	
	(0.163)	(0.128)	(2.819)	(0.337)	(0.457)	(0.478)	
State-Years	500	500		500	500		
(1/df) Deviance	1.132	1.136		1.132	1.136		
(1/df) Pearson	0.887	0.890		0.887	0.890		
-2 Log Likelihood	6777.371	6770.795		6777.371	6770.795		
Alpha	0.240	0.237		0.240	0.237		
Inpatient Detoxification	0.879	0.847	1.342	1.435	1.599	0.435	
	(0.198)	(0.226)	(1.356)	(0.720)	(1.188)	(0.765)	
<u> </u>	410	410		410	410		
State-Years	410	410		410	410		
(1/df) Deviance	1.126	1.126		1.126	1.126		
(1/df) Pearson	1.143	1.141		1.143	1.141		
-2 Log Likelihood	3892.883	3891.840		3892.883	3891.840		
Alpha	0.293	0.292		0.293	0.292		
T	0.004	0.614		1.0.10	1.004	0.007	
Inpatient Rehabilitation	0.924	0.614	7.322***	1.243	1.324	0.997	
	(0.315)	(0.230)	(3.716)	(0.319)	(0.360)	(0.287)	
Stata Vaars	470	470		470	470		
(1/df) Devience	470	1 1 2 0		1 1 2 0	1 1 2 0		
(1/df) Devrance	1.130	1.150		1.150	1.150		
(1/ul) realson	1.003	1.039		1.005	1.039		
-2 Log Likelillood	4//1.554	4749.090		4//1.554	4/49.090		
Alpha	0.512	0.297		0.512	0.297		
Ambulatory Treatment	0.830	0 823	0.007	1 663*	1 576	1 156	
Amoutatory reatment	(0.157)	(0.121)	(0.297)	(0.267)	(0,408)	(0.616)	
	(0.137)	(0.121)	(0.287)	(0.307)	(0.498)	(0.010)	
State-Years	494	494		494	494		
(1/df) Deviance	1.133	1.138		1.133	1.138		
(1/df) Pearson	0.880	0.888		0.880	0.888		
-2 Log Likelihood	6370.621	6370.438		6370.621	6370.438		
Alpha	0.237	0.237		0.237	0.237		

Table 5: Effect of State-Level Mandates on Co-Occurring Admissions

 $\begin{array}{l} \mbox{Coefficient is exponentiated; Cluster-robust standard errors(clustered by State) in parentheses} \\ + p < 0.10 & * p < 0.05 & ** p < 0.01 & *** p < 0.001 \end{array}$

	Unequal State-Level Mandate			Equal State-Level Mandate		
	OR	OR (standard error) OR O			OR (stand	lard error)
	(standard	No		(standard	No	
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity
Total Admissions	1.421	1.259	2.532**	0.728	0.698	1.400**
	(0.910)	(0.787)	(0.821)	(0.403)	(0.377)	(0.174)
Observations	208 527	208 527		208 527	208 527	
-2 Log Likelihood	213515 92	213162.08		213515.92	213162.08	
Pseudo R-Squared	0.261	0.262		0.261	0.262	
1 soudo R Squared	0.201	0.202		0.201	0.202	
Inpatient Detoxification	0.615	0.475	14.21+	0.336	0.315	1.757*
	(0.870)	(0.553)	(20.98)	(0.362)	(0.328)	(0.404)
	(,	()		(,	()	
Observations	82,571	82,571		82,571	82,571	
-2 Log Likelihood	85069.69	84771.45		85069.69	84771.45	
Pseudo R-Squared	0.237	0.239		0.237	0.239	
T (1 D. 1 1. '1' (2 77 4 4 4	2.040**	0 100**	1 140	1 270	0.624
Inpatient Renabilitation	3.774**	3.060**	2.122^{**}	1.140	1.379	0.624
	(1.605)	(1.166)	(0.582)	(0.471)	(0.596)	(0.185)
Observations	12,478	12,478		12,478	12,478	
-2 Log Likelihood	11499.75	11463.81		11499.75	11463.81	
Pseudo R-Squared	0.186	0.189		0.186	0.189	
Ambulatory Treatment	1.094	1.021	1.803 +	0.735	0.668	1.592*
	(0.625)	(0.592)	(0.544)	(0.346)	(0.313)	(0.353)
Observations	110,603	110,603		110,603	110,603	
-2 Log Likelihood	106809.97	106702.86		106809.97	106702.86	
Pseudo R-Squared	0.303	0.304		0.303	0.304	

Table 6: Effect of State-Level Mandates	on Alcohol OC)P Expenditures
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	Unequal State-Level Mandate			Equal State-Level Mandate		
	OR	R OR (standard error) OR			OR (standard error)	
	(standard	No		(standard	No	
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity
Total Admissions	1.329	1.116	2.436**	0.578	0.471	1.926***
	(0.772)	(0.648)	(0.709)	(0.375)	(0.320)	(0.257)
Observations	108 /00	108 /00		108 /00	108 /00	
2 Log Likelihood	106370 30	118572 73		106370 30	118572 73	
Pseudo P. Squared	0.237	0.240		0.237	0.240	
I seudo K-squared	0.237	0.240		0.237	0.240	
Innatient Detoxification	3 265	3 036	1 461	0.218	0.236	0 700***
inpatient 2 etc.inteation	(2.418)	(2.067)	(1.007)	(0.272)	(0.290)	(0.0698)
	()	(21007)	(11007)	(01272)	(0.2)0)	(0.0050)
Observations	17,986	17,986		17,986	17,986	
-2 Log Likelihood	12576.15	12562.82		12576.15	12562.82	
Pseudo R-Squared	0.368	0.368		0.368	0.368	
Inpatient Rehabilitation	2.771**	2.147*	2.292***	1.843	2.395*	0.444 +
	(1.049)	(0.697)	(0.557)	(0.747)	(0.860)	(0.199)
Observations	14 768	14 768		14 768	14 768	
-2 Log Likelihood	11712.28	11639 37		11712.28	11639 37	
Pseudo R-Squared	0.203	0.208		0.203	0.208	
	0.200	0.200		01200	0.200	
Ambulatory Treatment	0.871	0.774	1.984*	0.579	0.428	2.356***
,, j	(0.482)	(0.446)	(0.608)	(0.356)	(0.284)	(0.442)
	· · /					~ /
	_			_		
Observations	75,486	75,486		75,486	75,486	
-2 Log Likelihood	76815.89	76574.50		76815.89	76574.50	
Pseudo R-Squared	0.242	0.244		0.242	0.244	

Table 7:	Effect o	of State-Lev	el Mandates	on Substance	Abuse O	OP F	Expenditures
I GOIC / .	DILCCC 0	I Diate De	or realisation	on baobtanee	110000	~ •	anpenateares

	Unequal State-Level Mandate			Equal State-Level Mandate			
	OR	OR (stand	lard error)	OR	OR (stand	lard error)	
	(standard	No		(standard	No		
	error)	Comorbidity	Comorbidity	error)	Comorbidity	Comorbidity	
Total Admissions	1.591	1.383	2.065 +	0.547	0.488	1.504***	
	(1.087)	(0.897)	(0.835)	(0.298)	(0.273)	(0.186)	
Observations	174.533	174,533		174,533	174,533		
-2 Log Likelihood	153324.99	152999.93		153324.99	152999.93		
Pseudo R-Squared	0.302	0.304		0.302	0.304		
	01002	0.001		01002	0.001		
Inpatient Detoxification	2.138	2.138	0.993	0.191+	0.212+	0.534***	
1	(2.011)	(1.815)	(0.960)	(0.163)	(0.178)	(0.0620)	
	· · · ·	× ,	~ /	· · ·	~ /	× /	
	26.054	26.054		26.054	26.054		
Observations	26,954	26,954		26,954	26,954		
-2 Log Likelihood	22/86.36	22779.74		22/86.36	22779.74		
Pseudo R-Squared	0.341	0.342		0.341	0.342		
Innationt Robabilitation	5 875***	1 107***	2 10/1*	1 1/3	1 381	0.688	
Inpatient Kenabintation	(2.945)	(2,007)	(0.876)	(0.462)	(0.501)	(0.157)	
	(2.943)	(2.007)	(0.870)	(0.402)	(0.391)	(0.157)	
Observations	22,772	22,722		22,772	22,722		
-2 Log Likelihood	16787.82	16718.13		16787.82	16718.13		
Pseudo R-Squared	0.262	0.265		0.262	0.265		
Ambulatory Treatment	1.150	1.028	1.933+	0.614	0.503	1.806**	
	(0.785)	(0.709)	(0.675)	(0.372)	(0.321)	(0.337)	
Observations	118,979	118,979		118,979	118,979		
-2 Log Likelihood	107497.54	107279.48		107497.54	107279.48		
Pseudo R-Squared	0.308	0.309		0.308	0.309		

The coefficients in the tables above can be interpreted as Incidence Rate Ratios (IRR) for the treatment admissions models and Odds Ratios (OR) for the OOP models.

For unequal state-level mandates, all types of alcohol treatment admissions see a decrease in the rate of treatment admissions. For those without a psychiatric comorbidity, this insignificant decrease in the rate of treatment admissions is also the norm. For those with a psychiatric comorbidity, there is an insignificant decrease for inpatient detoxification and an insignificant increase in overall treatments and ambulatory admissions. An approximately 11fold increase (95% CI: 333%, 3500%) was seen in the rate of inpatient rehabilitation admissions for those with a psychiatric comorbidity covered under an unequal state-level mandate.

There were insignificant increases in total, inpatient rehabilitation, and ambulatory treatment admissions for states with an equal state-level parity mandate. Further, there was an insignificant decrease in the rate of inpatient detoxification admissions for alcohol treatment with an equal state-level parity mandate. For those without a psychiatric comorbidity, there was a marginal increase for the rate of alcohol inpatient rehabilitation admissions, while all other treatment categories did not experience a significant impact on treatment rates. There was an insignificant decrease in the rate of alcohol inpatient rehabilitation admissions for those with a psychiatric comorbidity, while all other treatment types saw an insignificant increase.

For substance abuse treatment admissions, there were insignificant decreases in the rate of treatment admissions for all admissions types. For those without psychiatric comorbidities, there were insignificant decreases in the rate of treatment admissions, except for an insignificant increase in treatment admissions for ambulatory treatment. Except for total substance abuse admissions, there was an insignificant decrease in the rate of treatment admissions under an unequal state-level parity mandate.

Under an equal state level parity mandate, all types of substance abuse treatments had insignificant increases in the rate of admissions. For those without psychiatric comorbidities, there was an insignificant increase in all individual types of admissions, but there was an insignificant decrease for total admissions. For those with psychiatric comorbidities there were almost five-fold increases for total admissions (CI: 42%, 2300%). While there was also a four-fold increase in the rate of substance abuse ambulatory treatment admissions (CI: 31%, 2000%) with an equal parity mandate, there was no change in the rate of inpatient rehabilitation or inpatient detoxification admissions.

For co-occurring treatment admissions under an unequal state-level mandate, there was an insignificant decrease in the rate of treatment admissions for all admission types. For those who are not ailed by a psychiatric comorbidity, there was an insignificant decrease for all cooccurring treatment types, except for a 36 percent decrease (CI: 5%, 57%) in the rate of total cooccurring treatment admissions. For those with psychiatric comorbidities, there is an insignificant increase in the rate of total admissions and inpatient detoxification admissions, an insignificant decrease for ambulatory treatment admissions, and an almost seven-fold increase in co-occurring inpatient rehabilitation admissions (CI: 170%, 1790%).

With an equal state parity mandate, there is a marginal increase in the rate of treatment admissions for total admissions, an insignificant decrease in co-occurring inpatient detoxification and inpatient rehabilitation admissions, and a 66 percent increase in the rate of ambulatory treatment admissions (CI: 8%, 756%). For those without a psychiatric comorbidity, the rate of co-occurring treatment admissions insignificant increase for all treatment admissions. For those with psychiatric comorbidities, there is an insignificant increase in the rate of co-occurring total

and ambulatory admissions, while there is an insignificant decrease in the rate of co-occurring inpatient detoxification and inpatient rehabilitation treatment admissions.

For unequal state-level mandates, there is an insignificant increase in the odds of paying primarily out-of-pocket for total alcohol admissions, ambulatory treatment admissions, while there is an insignificant decrease in odds for inpatient detoxification. There is a 277 percent (CI: 64%, 768%) increase in the odds of paying primarily out-of-pocket for alcohol inpatient rehabilitation admissions. For those without psychiatric comorbidities, there is also an insignificant increase in the odds of paying out-of-pocket for all treatment types, except for alcohol inpatient rehabilitation. For those with psychiatric comorbidities there is a 153 percent increase (CI: 34%, 378%) and a 122 percent increase (CI: 23%, 145%) in the odds of paying primarily out-of-pocket for total admissions.

For equal state-level mandates, there is an insignificant decrease in the odds of paying primarily out-of-pocket, except for an insignificant increase in the odds of paying out-of-pocket for alcohol inpatient rehabilitation admissions. For those without psychiatric comorbidities, the results are the same as those when there was no control for psychiatric comorbidities. Finally, for those with psychiatric comorbidities, there is a 40 percent increase (CI: 10%, 78%) 75 percent increase (CI: 12%, 175%), and 59 percent increase (CI: 3%, 146%) in odds, respectively, for alcohol total, inpatient rehabilitation, and ambulatory treatment admissions. There were insignificant increases in odds for those with psychiatric comorbidities who used alcohol inpatient rehabilitation services.

For substance abuse service treatment, there were insignificant increases in odds for total admissions and inpatient detoxification while there were insignificant decreases in odds for ambulatory treatment under an unequal state-level mandate. There was a 177 percent increase

(CI: 32%, 482%) in substance abuse inpatient rehabilitation admissions. For those without psychiatric comorbidities, all results remained the same except for a 115 percent increase (CI: 14%, 306%) in the odds of paying primarily out-of-pocket for substance abuse inpatient rehabilitation admissions. For those with psychiatric comorbidities, there were 143 percent (CI: 38%, 331%), 129 percent (CI: 18%, 384%), and 98 percent (CI: 9%, 262%) increases in odds for total admissions, inpatient rehabilitation admissions, and ambulatory treatment admissions respectively. The odds for substance abuse inpatient detoxification admissions did not increase significantly for those with psychiatric comorbidities.

For co-occurring disorders treatment, there were insignificant increases for all treatment admissions, except a five-fold increase (CI: 120%, 1470%) in inpatient rehabilitation admissions for inpatient rehabilitation admissions under an unequal state-level parity mandate. The results largely held for those without psychiatric comorbidities, except a 350 percent increase (CI: 87%, 978%) for inpatient rehabilitation admissions. There were marginal increases for total admissions and ambulatory treatment admissions as well as an insignificant decrease in the odds of paying primarily out-of-pocket for those with psychiatric comorbidities. Finally, there was a 119 percent increase (CI: 1%, 378%) in the odds of paying primarily out-of-pocket for co-occurring inpatient rehabilitation admissions.

For equal state-level parity mandates, there are insignificant increases in the odds of paying primarily out-of-pocket for inpatient rehabilitation admissions as well as insignificant decreases for total admissions and ambulatory treatment admissions. For those without psychiatric comorbidities, the results mirror those before controlling for psychiatric comorbidities. For equal state-level parity mandates, there is a 50 percent increase (CI: 19%, 41%), 80 percent increase (CI: 25%, 160%), and a 53 percent decrease (CI: 33%, 57%) in the

odds of paying primarily out-of-pocket for total admissions, ambulatory treatment admissions, and inpatient detoxification admissions, respectively.

Regression Models: Specific Aim 2 Models

	MHPAEA					
	IRR	IRR (stand	dard error)			
	(standard	No				
	error)	Comorbidity	Comorbidity			
		2	<u>J</u>			
Total Admissions	1.197	1.632+	0.180			
	(0.151)	(0.467)	(0.199)			
State-Years	256	256				
(1/df) Deviance	1.144	1.156				
(1/df) Pearson	0.857	0.868				
-2 Log Likelihood	3231.69	3221.23				
Alpha	0.304	0.292				
Inpatient Detoxification	1.511*	2.147**	0.211*			
	(0.271)	(0.546)	(0.158)			
State-Years	216	216				
(1/df) Deviance	1.052	1.062				
(1/df) Pearson	0.738	0.734				
-2 Log Likelihood	1883.67	1878.12				
Alpha	0.365	0.356				
Inpatient Rehabilitation	1.217	1.980 +	0.210 +			
	(0.167)	(0.694)	(0.197)			
State-Years	234	234				
(1/df) Deviance	1.082	1.093				
(1/df) Pearson	0.769	0.804				
-2 Log Likelihood	1996.36	1988.77				
Alpha	0.358	0.347				
Ambulatory Treatment	1.194	1.472	0.247			
	(0.160)	(0.420)	(0.218)			
State-Years	254	254				
(1/df) Deviance	1.1435	1,1580				
(1/df) Pearson	0.8672	0.8699				
-2 Log Likelihood	3030.23	3021.64				
Alpha	0.303	0.292				

 $\begin{array}{l} \mbox{Coefficient is exponentiated; Cluster-robust standard errors} \\ \mbox{(clustered by State) in parentheses} \\ \mbox{+} p < 0.10 & * p < 0.05 & ** p < 0.01 & *** p < 0.001 \end{array}$

	MHPAEA		
	IRR IRR (standard error)		
	(standard	No	
	error)	Comorbidity	Comorbidity
Total Admissions	1.018	1.822	0.148
	(0.230)	(0.666)	(0.195)
State-Years	257	257	
(1/df) Deviance	1.139	1.148	
(1/df) Pearson	0.749	0.768	
-2 Log Likelihood	3706.97	3693.07	
Alpha	0.346	0.330	
Inpatient Detoxification	1.089	2.279**	0.0963**
	(0.234)	(0.701)	(0.0868)
State-Years	216	216	
(1/df) Deviance	1.099	1.114	
(1/df) Pearson	0.855	0.888	
-2 Log Likelihood	2120.88	2103.88	
Alpha	0.335	0.307	
Inpatient Rehabilitation	0.993	2.324*	0.123*
	(0.232)	(0.881)	(0.124)
State-Years	251	251	
(1/df) Deviance	1.144	1.16	
(1/df) Pearson	0.820	0.79	
-2 Log Likelihood	2763.93	2748.63	
Alpha	0.393	0.370	
Ambulatory Treatment	1.244	1.590 +	0.383
	(0.248)	(0.446)	(0.369)
State-Years	255	255	
(1/df) Deviance	1.130	1.144	
(1/df) Pearson	0.776	0.790	
-2 Log Likelihood	3466.92	3462.94	
Alpha	0.301	0.296	

Table 10: Effect of MHPAEA on Substance Abuse Admissions

+ p < 0.10 * p < 0.05 ** p < 0.01 *** p < 0.001

		MHPAEA	
-	IRR		
	(standard		
-	error)	IRR (standa	rd Error)
-		No	
		Comorbidity	Comorbidity
Total Admissions	0.937	1.805	0.0890 +
	(0.164)	(0.682)	(0.111)
State-Years	258		258
(1/df) Deviance	1.153		1.163
(1/df) Pearson	0.646		0.695
-2 Log Likelihood	3727.83		3710.52
Alpha	0 373		0 351
1 ipin	0.575		0.331
Inpatient Detoxification	0.950	1.324	0.278
1	(0.234)	(0.451)	(0.226)
	(0))	(00.000)	(**==*)
State-Years	218		218
(1/df) Deviance	1.088		1.093
(1/df) Pearson	0.770		0.758
-2 Log Likelihood	2021.55		2009.99
Alpha	0.349		0.333
Inpatient Rehabilitation	0.730	1.230	0.263 +
-	(0.170)	(0.399)	(0.210)
State-Years	251		251
(1/df) Deviance	1.123		1.142
(1/df) Pearson	0.884		0.878
-2 Log Likelihood	2693.65		2685.34
Alpha	0.329		0.316
Ambulatory Treatment	1.266	1.476	0.459
	(0.182)	(0.484)	(0.428)
State-Years	256		256
(1/df) Deviance	1.133		1.1462
(1/df) Pearson	0.692		0.7070
-2 Log Likelihood	3475.54		3470.85
Alpha	0.311		0.306

Table 1	1: Effect	of MHPAEA	on Co-Oc	curring A	Admissions

+ p < 0.10 * p < 0.05 ** p < 0.01 *** p < 0.001

	MHPAEA		
	OR OR (standard error)		
	(standard	No	
	error)	Comorbidity	Comorbidity
Total Admissions	1.754**	1.730**	1.032
	(0.318)	(0.315)	(0.142)
	06.026	06.026	
Observations	96,036	96,036	
-2 Log Likelihood	108/04.96	/2467.15	
Pseudo R-Squared	0.353	0.353	
Innatient Detoxification	3 707**	4 022***	1 092
inputent Detoxineution	(1.704)	(1.634)	(0.365)
	(1.701)	(1.051)	(0.505)
Observations	35,247	35,247	
-2 Log Likelihood	33632.82	33590.89	
Pseudo R-Squared	0.255	0.256	
Tu u d'und Dalah 111 dada u	0.700	0.704	1.079
Inpatient Rehabilitation	0.789	0.704	1.068
	(0.436)	(0.490)	(0.458)
Observations	7,727		7,727
-2 Log Likelihood	3779.15		3776.75
Pseudo R-Squared	0.334		0.335
Ambulatory Treatment	1.252	1.259	0.917
	(0.298)	(0.269)	(0.165)
Observations	46,139	46,139	
-2 Log Likelihood	30412.61	30395.05	
Pseudo R-Squared	0.447	0.447	
Coefficient is exponentiated: Cluster reput standard errors			

Table 12: Effect of MHPAEA on Alcohol OOP Expenditures

	MHPAEA		
	OR OR (standard error)		
	(standard	No	
	error)	Comorbidity	Comorbidity
Total Admissions	1.389	1.219	1.251
	(0.494)	(0.378)	(0.242)
Observations	186 254	186 254	
2 Log Likelihood	53500.13	53264.24	
-2 Log Likelihood	0 477	0.470	
rseudo K-Squaleu	0.477	0.479	
Inpatient Detoxification	3.985*	3.252+	1.778
r	(2.272)	(2.017)	(0.786)
	()	()	(00000)
	1 < 0 < 7	1000	
Observations	16,865	16,865	
-2 Log Likelihood	5986.77	5961.11	
Pseudo R-Squared	0.371	0.373	
	0.545	0.445%	1.056
Inpatient Rehabilitation	0.545	0.445*	1.356
	(0.221)	(0.157)	(0.278)
Observations	34,608	34,608	
-2 Log Likelihood	6305.21	6295.80	
Pseudo R-Squared	0.457	0.457	
Ambulatory Treatment	1.114	0.986	1.221
	(0.389)	(0.283)	(0.234)
Observations	132.822	132,822	
-2 Log Likelihood	37658 27	37464.86	
Pseudo R-Squared	0 528	0 530	
Coefficient is exponentiated: Cluster rebust standard errors			

Table 13: Effect of MHPAEA on Substance Abuse OOP Expenditures

 $\begin{array}{l} \mbox{Coefficient is exponentiated; Cluster-robust standard errors} \\ \mbox{(clustered by State) in parentheses} \\ \mbox{+} p < 0.10 & * p < 0.05 & ** p < 0.01 & *** p < 0.001 \\ \end{array}$

	MHPAEA		
	OR OR (standard error)		
	(standard	No	
	error)	Comorbidity	Comorbidity
Total Admissions	1.381	1.304	1.052
	(0.352)	(0.276)	(0.224)
Observations	164 651		164 651
2 Log Likelihood	6946245		69397 70
-2 Log Likelillood	0.463		00307.70
r seudo K-Squaled	0.403		0.404
Inpatient Detoxification	3.417**	3.799**	0.979
I	(1.363)	(1.783)	(0.266)
Observations	21.022		21.022
Observations	21,023		21,025
-2 Log Likelilood	24041.35		0.206
Pseudo K-Squared	0.505		0.300
Inpatient Rehabilitation	0.510+	0.469*	1.041
inputent frenderintation	(0.178)	(0.168)	(0.235)
	(01170)	(01100)	(0.200)
01	20 (01		20 (01
Observations	30,681		30,681
-2 Log Likelinood	/04/.99		/038.18
Pseudo R-Squared	0.446		0.447
Ambulatory Treatment	1.070	0.967	1.240
	(0.264)	(0.175)	(0.293)
	(0.201)	(0.175)	(0.293)
Observation	101 200		101 200
Observations	101,280		101,280
-2 LOG LIKEIINOOD	39938.49		398/0.50
Pseudo K-Squared	0.527		0.527

Table 14: Effect of MHPAEA on Co-Occurring OOP Expenditures

For alcohol treatment admissions, the MHPAEA insignificant increased treatment admissions for the privately insured compared to Medicaid for all treatment types, except a 51 percent increase (CI: 5%, 117%) for the rate of alcohol inpatient detoxification treatment admissions. Again, for those without psychiatric comorbidities, all treatment types experienced insignificant increases, except for a 114 percent increase (CI: 28%, 260%) in the rate of alcohol inpatient detoxification admissions. For those with psychiatric comorbidities, there were insignificant decreases in the rate of alcohol treatment admissions for the private insurance population compared to Medicaid after the MHPAEA, except for a 79 percent decrease (CI: 8%, 95%) in the rate of treatment admissions for the rate of inpatient detoxification admissions.

The rate of substance abuse treatment admissions insignificant increased after the MHPAEA for the private insurance population compared to Medicaid for all treatment types, except for an insignificant increase in the rate of substance abuse inpatient rehabilitation admissions. For those without psychiatric comorbidities, the rate of substance abuse inpatient detoxification and inpatient rehabilitation admissions increased by 128 percent (CI: 25%, 317%) and 132 percent (CI: 10%, 389%) respectively for the privately insured compared to Medicaid after the implementation of the MHPAEA. Also, the rate of privately insured admissions post-MHPAEA compared to Medicaid decreased by 90 percent (CI: 44%, 98%) and 88 percent (CI: 11%, 98%), respectively for substance abuse inpatient detoxification and inpatient rehabilitation admissions.

For co-occurring treatment admissions, the MHPAEA insignificantly decreased the rate of co-occurring admissions for all treatment types, except for an insignificant increase for ambulatory treatment admissions. For those without psychiatric comorbidities, there were

insignificant increases throughout while there were insignificant decreases in the rate of cooccurring treatment admissions for those with psychiatric comorbidities.

For alcohol treatment admissions, the MHPAEA increased the odds of paying out-ofpocket by 75 percent (CI: 23%, 150%) and 270 percent (CI: 51%, 813%) respectively, for total alcohol admissions and alcohol inpatient detoxification admissions for the privately insured compared to those on Medicaid. For those without psychiatric comorbidities, there is a 73 percent increase (CI: 21%, 147%) and 300 percent increase (CI: 81%, 793%), respectively, in the odds of paying primarily out-of-pocket for total admissions and inpatient detoxification admissions. Finally, all alcohol treatment types had an insignificant increase in the odds of paying primarily out-of-pocket for those with psychiatric comorbidities.

For substance abuse admissions, there is a three-fold increase (CI: 30%, 1118%) in the odds of paying primarily out-of-pocket for inpatient detoxification admissions for the privately insured to the Medicaid population post MHPAEA. For those without psychiatric comorbidities, there is a 56 percent decrease (CI: 11%, 78%) in the odds of paying primarily out-of-pocket for inpatient rehabilitation admissions while there is a marginal decrease in the odds of paying primarily out-of-pocket for substance abuse inpatient detoxification admissions. There are insignificant increases in odds for all substance abuse treatment types for those with psychiatric comorbidities.

For co-occurring admissions, there is a 242 percent increase (CI: 56%, 647%) in the odds of paying primarily out-of-pocket post-MHPAEA for the privately insured versus the Medicaid population for inpatient detoxification. There is also a marginal decrease in the odds of paying primarily out-of-pocket for co-occurring inpatient rehabilitation admissions. For those without psychiatric comorbidities, there is a 279 percent increase (CI: 51%, 853%) and a 54

percent decrease (CI: 5%, 77%) in the odds of paying out-of-pocket for co-occurring inpatient detoxification admissions and inpatient rehabilitation admissions, respectively. For all co-occurring treatment types, there are insignificant increases in the odds of paying primarily out-of-pocket for the privately insured versus Medicaid after the implementation of the MHPAEA.
DISCUSSION

Earlier, we hypothesized that unequal state-level parity mandates would insignificantly increase the rate of SUD treatment admissions. In general, the results presented above showed that the SUD treatment admission rate insignificantly decreased for unequal state-level parity mandates; however, there were insignificant increases in the SUD treatment admission rate for persons with psychiatric comorbidities. Further, equal state-level parity mandates were hypothesized to significantly increase the rate of SUD treatment admissions. This hypothesis was ultimately rejected since there were insignificant increases for equal state-level parity mandates. While still insignificant, there were consistently stronger increases in the rate of SUD treatment admissions for SUD treatment admissions with psychiatric comorbidities.

Unequal state-level parity mandates were hypothesized to have increased odds of paying primarily out-of-pocket as two papers document that insurers would change cost-sharing arrangements if possible to control costs in order to avoid cost increases due to increased utilization from parity (US GAO, 2000; Barry et al., 2006). These results were somewhat confirmed, as the odds of paying primarily out-of-pocket increase, albeit insignificantly, for all treatment types. This increase in the odds of paying out-of-pocket increased more for those with psychiatric comorbidities.

Equal parity mandates were expected to decrease the odds of primarily paying out-ofpocket since cost-sharing arrangements are now at parity with general medical and surgical services. This also was generally confirmed; however, psychiatric comorbidities often resulted in increased odds of paying primarily out-of-pocket for treatment with an equal state-level parity mandate in effect.

The MHPAEA was expected to have even a larger increase in treatment admissions than state-level mandates. This hypothesis is also largely rejected, as there were insignificant increases in utilization found in the privately insured subject to the MHPAEA versus Medicaid who were not under the scope of the MHPAEA. In general, the rate of SUD treatment admissions insignificantly decreased for those with psychiatric comorbidities following the implementation of the MHPAEA. These results are quite surprising; however, Buck (2011) does talk about the challenges with specialty SUD treatment centers. Some of the issues mentioned by Buck (2011), namely the lack of placement on preferred provider lists and not accepting private insurance, as a reason why SUD treatment admissions reported by SUD centers with public funding may have declined.

The MHPAEA was expected to decrease the odds even more of paying primarily out-ofpocket than equal state-level parity mandates. This result was not confirmed, as there was an increase in the odds of paying primarily out-of-pocket, even a significant increase in odds of paying out-of-pocket for alcohol treatment admissions. This increase in odds of paying primarily out-of-pocket holds for those with psychiatric comorbidities, which makes these results quite surprising. While Medicaid is not at full parity yet, it is possible that persons on Medicaid pay less frequently out-of-pocket for behavioral health care. Also, those on Medicaid may be able to claim charity care due to income constraints, thus being able to not pay out-of-pocket. Finally, persons on Medicaid may be able to receive treatment grants and benefit from other programs that are only available to the Medicaid program and not private insurance beneficiaries.

Limitations

There are several limitations of this thesis that likely affect the results presented above. All results should be interpreted in light of these limitations, as the limitations may have a material effect on the results.

A main limitation that affects the results is not all states report information about psychiatric comorbidity information every year to the TEDS-A system. This results in some missing information. While reducing the sample size to the 40 states who report insurance information overcomes most of the issue, there is still some information that is missing on psychiatric comorbidities. Care should be taken to interpret the results of the DDD models in light of this limitation.

The effect of the MHPAEA results may not be fully reflected in the results presented above. The Final Rule of the MHPAEA became effective in 2014, for which we do not yet have data. The results are based off the original statutory provisions, which do not have the same scope and impact of the Final Rule. In addition, many PPACA provisions did not become effective until 2014 and cannot be evaluated with the current dataset.

Limitations: TEDS-A Dataset

There are several limitations of the TEDS-A. One of the most important limitations is that the reporting of TEDS-A data depends on external factors that affect each state differently. Different levels of state substance abuse funding may affect total admissions as well as the demographic mix of admissions. In order to overcome this limitation of the TEDS-A dataset, all analysis controls for a mix of demographic factors in order to help partially control for the differences in external factors that may affect treatment admissions; however, it is impossible to tell if all external funding differences have been adequately controlled for (SAMHDA, 2012).

The definition of an admission can vary from state to state depending on the standards for state reporting. States can also vary in the way that they refer substance abuse treatments through their criminal justice systems. (SAMHDA, 2012). While these standards for reporting cannot be completely overcome, there were several things to help mitigate some of the difference in standards. In the models for Specific Aims 1 and 2, all models included a fixed effect for year and state, in order to control for any trends over time or across states that could produce a significant association when there is none in reality. In addition, all models controlled for state population, either as an offset or as a covariate. Dave et al. (2011) noted that the control for state population partially control for differences in states. Also, ICPSR and SAMHDA also continually review treatment data for any systemic issues that would bias any results from the analysis of the TEDS-A dataset (SAMHDA, 2012).

One issue that cannot be controlled for is that TEDS-A includes multiple admissions for each client and each client is reported anonymously. Also, any transfers between different types of admissions are not guaranteed to be reported in the TEDS-A dataset. These are done in part to protect the confidentiality of those with substance abuse admissions reported in TEDS-A. Therefore, this thesis could only be analyzed at the event-level instead of the person-level, which could bias the results of this study.

Limitations: Omitted Insurance Variables

Throughout the results, there are very large standard errors and corresponding confidence intervals. This is likely due to important omitted variables in the dataset. While doing everything to control for the endogeneity of a policy between states, there could still be information that is exclusive to states. There are several states that omit important insurance information that may bias the results of this study.

The type of private insurance is not reported for confidentiality reasons. Most private insurance plans are large group plans; however, a small minority of plans are small group or individual insurance plans. All state-level parity mandates, with the exemption of self-insured plans, cover large group plans; however, not every mandate covers small group or individual insurance plans. Thus, some private insurance plans may not have parity provisions, which can lead to bias in the study. Also, the MHPAEA added provisions for small group and individual plans in the Final Rule (Federal Register, 2013) and the effect of this Final Rule cannot be evaluated.

The actual insurance plan and the information contained in the insurance plans are omitted. There are many parity studies that use a specific plan instead of aggregated data (Azzone et al., 2011; Busch et al., 2013; Goldman et al., 2006; McConnell et al., 2012). The biggest bias would be with unequal state-level parity mandates, where health insurance plans are able to place different QTLs and cost-sharing provisions, as long as they meet the minimum benefits specified in the parity mandate.

There is no information on the managed care tools being used in insurance plans. The managed care tools, particularly prior authorization and other cost-control tools, may limit the effect of parity. Until the MHPAEA, these managed care tools could be applied at less than parity for behavioral health. This could bias the results as issues with managed care tools could cause denied admissions and denied claims. Also, the effect of the MHPAEA NQTL parity provisions cannot be directly examined without information about the managed care tools used in the health plans.

Future Research Directions

There are several future research directions to explore for behavioral health parity mandates, especially for the evaluation of the MHPAEA mandate. The MHPAEA has not been evaluated in the scientific literature due to the recent passage of the mandate. With the Final Rule in effect in 2014, it will take several years until the evaluation of the Final Rule of the MHPAEA becomes feasible. Some of these future research directions can be explored using the TEDS-A and TEDS-D datasets; however, other research directions require other data sources to evaluate the MHPAEA.

With the TEDS-A and TEDS-D datasets, there are a few future research directions that researchers can explore. TEDS-A contains detailed information on the substances abused. Future researchers can study the effects of parity for different substances, much like how Busch et al. (2013) studied the effects of FEHB parity by different mental health diagnoses. The inpatient rehabilitation treatment category can also be further split between short-term (< 30 days) and long-term (> 30 days) rehabilitation treatment.

With the implementation of the MHPAEA, claims data would be the gold standard to look at the impact of the MHPAEA on behavioral health utilization and expenditures. Similar to the FEHB parity study performed by Goldman et al. (2006), analyzing specific insurance plans for the before and after effects would assist in the more accurate estimate of the effect of the MHPAEA. Also, with the expanded provisions in the Final Rule, the small group and individual insurance markets are a future research direction to look at parity. One final research direction would be to look at the differences between managed care plans and consumer directed health plans, as consumer directed health plans have different cost-sharing arrangements than managed care, which may confound the results of any parity study not controlling for these plans.

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