

THE IMPACT OF STATE HEALTH INSURANCE PARITY LAWS ON
INITIATION OF SUBSTANCE USE DISORDER TREATMENT

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ABSTRACT

Statement of Problem: The implementation of the Patient Protection and Affordable Care Act (PPACA) of 2010 is expected to change the Substance Use Disorder (SUD) treatment system drastically through its expansion of federal parity protections on mental health and SUD benefits. However, the impact of previously existent state-specific parity laws on access to and use of SUD treatment has not been fully explored. In this study, we aim to compare initiation of substance use treatment between individuals in states with and without SUD parity laws in the year 2001, using longitudinal data from two waves of the National Epidemiologic Survey on Alcohol and Related Conditions that took place respectively in 2001-2002 and 2004-2005.

Methods: Stabilized inverse probability of treatment weights were used in conjunction with survey weights to adjust for potential confounders. Logistic regression models were then used to compare odds of treatment initiation among individuals reporting past year substance use (but no past year substance use treatment) in states with SUD parity laws compared to states with no laws. Sub-analyses were performed to focus on individuals with lifetime history of SUD as well as to analyze separately alcohol users and other substance users.

Results: Individuals reporting past year substance use at baseline in parity states had a 1.55 higher odds of treatment initiation than those in states without SUD parity (95% CI: 0.63-3.81). Individuals with lifetime history of SUD at baseline in parity states and current substance use had a 1.69 higher odds of treatment initiation than those in states without SUD parity (95% CI: 0.81-3.54). Individuals with lifetime history of AUD (no

other SUDs) at baseline in parity states and current substance use had a 4.61 higher odds of treatment initiation than those in states without SUD parity (95% CI: 1.27-16.77).

Conclusions: Parity was only associated with significantly higher odds of SUD treatment initiation among those with lifetime history of AUD and current substance use.

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TABLE OF CONTENTS

ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	vii
1. INTRODUCTION	1
1.1 Substance Use Disorders.....	1
1.2 Substance Use Treatment and Treatment Barriers.....	3
1.3 History of Health Insurance Parity Laws for Substance Use.....	4
1.4 Study Goal	6
2. METHODS	8
2.1 Study Population.....	8
2.2 Exposure (Independent Variable)	9
2.3 Outcome (Dependent Variable)	10
2.4 Analyses	11
3. RESULTS	13
4. DISCUSSION	15
5. TABLES	18
6. APPENDIX.....	23

7. REFERENCES.....	29
8. CURRICULUM VITAE.....	34

LIST OF TABLES

TABLE 1: Inclusions and Exclusions.....	18
TABLE 2: Study Population Characteristics	19
TABLE 3: IPTW Weighted Study Population Characteristics.....	20
TABLE 4: Bivariate Odds Ratio of Treatment Initiation (Parity vs. Non-Parity).....	21
TABLE 5: Adjusted Odds Ratio of Treatment Initiation (Parity vs. Non-Parity).....	22

1. INTRODUCTION

The implementation of the Patient Protection and Affordable Care Act (PPACA) of 2010 is expected to have changed the substance use disorder treatment system through its expansion of federal parity protections for mental health and substance use disorder benefits. However, it is not known to what degree increased coverage of substance use disorder treatment will have resulted in greater treatment utilization after the PPACA's enactment in 2014. The variety of state legislation that existed before the implementation of the PPACA provides an opportunity to explore the impact of previous parity laws on access to and use of substance use disorder treatment.

1.1 SUBSTANCE USE DISORDERS

Substance use disorders (SUDs) are a collection of medical conditions related to the use of one of 9 classes of substances. The 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), released in 1994, describes generally that substance dependence, one of the two forms of substance use disorder (SUD) is a “cluster of cognitive, behavioral, and physiological symptoms indicating that the individual continues using the substance despite significant substance-related problems.” More specifically, the DSM-IV considers 7 criteria related primarily to impairment and use, including reduced or lack of control around quantity and frequency of use, impairment in social and work life and inability to meet obligations, but also to physiological-related symptoms, such as withdrawal. Of these 7 criteria, 3 or more must have been met in the prior 12 months for a diagnosis of the disorder. Substance abuse, the other form of substance use disorder, applies to individuals who do not meet the criteria of substance dependence and considers four slightly different criteria relating to recurrent use despite

impairment in social and work life, use in hazardous situation, and legal problems relating to use, of which only one criteria must be met in the previous 12 months for a diagnosis of the disorder.¹

Substance use, particularly alcohol use, is very prevalent in the United States, with more than 138 million reporting past month alcohol use and more than 27 million reporting past month use of illegal substances in 2015, representing 51.7% and 10.1% of the population greater than 12 years of age respectively.² A total of 66.7 million Americans (24.9% of the US population) reported binge drinking in the past month (more than 5 drinks on a single occasion for men, and greater than 4 for women) and 17.3 million (6.5% of the population) reported binge drinking on more than 5 days in the past month.² Across age strata, white individuals have an increased risk of alcohol use, as well as binge or heavy drinking.^{3,4,5,6}

Of all substance users in the US, 20.8 million are estimated to have an SUD, of whom 15.7 million are estimated to have an alcohol use disorder and 7.7 million are estimated to have an illicit drug use disorder (DUD) (~6% and ~3% of the population over the age of 12).² Men are nearly twice as likely as women to have a SUD, and the prevalence of SUDs in the population peaks among 20-29 year-olds, with those who develop SUDs at younger ages more likely to have an SUD into later adulthood.⁷ Those who are married tend to have a lower incidence of both AUD as well as illicit DUDs.^{8,3}

SUDs are associated with high rates of comorbid psychiatric disorders. Over a third of those with an SUD also have a comorbid DSM-IV disorder (any psychiatric illness), excluding developmental disorders, and over 10% of those with an SUD have a comorbid mental illness that substantially interferes with or limits one or more major life

activities (serious psychiatric disorder).² In a national population sample, those with SUD in the prior 12 months had a 20% 12-month prevalence of mood disorders compared to 8% for those without SUD.⁹

Substance use is also associated with a variety of negative physical health outcomes. Alcohol use alone is responsible for 4% of the global disease burden, being causally associated with a wide variety of ailments, from esophageal, liver and breast cancers to cardiovascular disorders such as ischemic heart disease.¹⁰ Drug poisoning (which includes overdose deaths as well as other accidental and intentional poisonings) has outnumbered deaths by firearms, motor vehicle crashes, suicide and homicide in the United States since 2009 to the present, with driving under the influence associated with thousands of additional deaths per year.¹¹

1.2 SUBSTANCE USE TREATMENT AND TREATMENT BARRIERS

Entry into treatment for SUDs is low. Of the 21.7 million Americans estimated to have needed substance use treatment in 2015, only 3.0 million received treatment (14.0% of those needing treatment) and only 2.3 million received treatment at a specialty facility (10.8%).² Only 8% of individuals with AUD had past-year AUD treatment.¹² In one study, Harris et al. found that co-occurring mental illness and SUD does not make individuals more likely to seek mental health treatment than individuals with only mental illness.¹³ However, Chen et al., using data from a nationally representative survey (National Survey on Drug Use and Health 2005-2010), found that participants with a past year major depressive episode and co-occurring SUD were more likely to seek mental health services of all types.¹⁴

The most common place where individuals receive treatment is at 12-step mutual-help meetings, with other common sources of care being detoxification wards, outpatient clinics, rehabilitation programs, and private professionals including physicians, psychiatrists, psychologists and social workers.¹² Despite low treatment utilization, there is a wide variety of evidence supporting the benefits of some of the most common sources of SUD treatment, including peer self-help organizations, many psychosocial and/or behavioral treatments and even brief interventions by medical professionals.¹⁵

There are a variety of barriers to entering or receiving substance use treatment, with financial barriers being of special importance. Using 6 years of the National Survey on Drug Use and Health (2005-2006), a nationally representative cross-sectional survey, Chen et al. found that, among participants with SUDs, financial barriers were the second most common barrier to treatment, after not being ready to stop using substances.¹⁶ Using a cross-sectional wave of the National Epidemiologic Survey on Alcohol and Related Conditions (2001-2002), Kaufmann et al. found financial barriers to be an important barrier to alcohol use treatment, with 10% of those with lifetime history of AUD only and 20% of those with lifetime history of AUD and comorbid mood and anxiety disorders listing it as a barrier to receiving treatment.¹⁷

1.3 HISTORY OF HEALTH INSURANCE PARITY LAWS FOR SUBSTANCE USE

States are able to and often do enact legislation that requires insurers to cover specific types of treatment and health conditions. For substance use, we can distinguish between three levels of state-mandated substance use treatment coverage. **Mandated offerings laws** require that insurers cover substance abuse treatment to the same level as

surgical or medical treatments if the insurers choose to offer coverage for substance use. **Mandated benefits laws** require that insurers cover substance abuse treatment to some specified level but not to the same level as surgical or medical treatments. **Parity laws** require that insurers cover substance abuse treatment to the same level as surgical or medical treatments.

Prior to the enactment of the Patient Protection and Affordable Care Act in 2014, a wide range of disparities in coverage existed between substance abuse treatment coverage and medical and surgical coverage. An early wave of states, especially in the South, in the late 1970s through the 1980s passed a variety of mandated benefit or mandated offering laws, especially in regards to alcohol abuse treatment. In the 1990s, states moved towards more comprehensive mandated benefit laws, culminating in the first substance abuse parity law passed in Vermont in 1997.¹⁸ While states continued to pass laws mandating substance abuse treatment coverage in the early 2000s, some states weakened requirements for insurers.¹⁸

The history of federal parity laws for substance abuse is much more recent. While President Bill Clinton oversaw the passage and enactment of the Mental Health Parity Act in 1996, no substance abuse treatment parity was enacted until 2008, at which point President George W. Bush signed the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act (MHPAE), which affected employer sponsored plans for employers with more than 50 employees. The MHPAE is a mandated offerings laws and requires employers, if they choose to offer behavioral health coverage (including substance abuse treatment), to offer it at the same levels as medical and surgical benefits. The law was also applied to Medicaid managed care, Medicare Advantage (if offered

through a group plan), state and local government plans, and the State Children's Health Insurance Program. The MHPAE created minimum standards for states but did not supersede more stringent state-level parity laws.¹⁹

The MHPAE was followed in 2010 by the Patient Protection and Affordable Care Act (PPACA). The PPACA addressed disparities in limits to both the amount of coverage (e.g., annual/lifetime limits, limited inpatient coverage) and the types of mental health and substance abuse conditions covered. As part of the PPACA, substance abuse treatment was defined as an essential health benefit, requiring that state exchanges must offer coverage. Additionally, this coverage must be at the same level as surgical and medical coverage, and this parity requirement applies not only to the state exchanges but also to Medicaid.²⁰

1.4 STUDY GOAL

While the PPACA has greatly expanded coverage of substance use disorder treatment, it is not known to what degree it has resulted in greater treatment initiation. Unfortunately, there are limited data that provide information on SUD treatment utilization pre- versus post-PPACA. In addition, there has been a paucity of information regarding the potential impact of the pre-PPACA parity legislation on service use. Therefore, the goal of this study was to assess whether SUD treatment initiation differed between individuals living in states with SUD parity laws in the year 2001 relative to individuals living in states with no parity laws. Specifically, we hypothesized that individuals with SUD and/or AUD who reside in states with parity laws would be more likely to initiate treatment relative to those living in states without parity laws. Better

understanding of the influence of parity laws on treatment initiation can help us understand the probable effect of the PPACA on treatment initiation among individuals with SUD.

2. METHODS

2.1 STUDY POPULATION

We used data from the National Epidemiologic Survey on Alcohol and Related Conditions, Wave 1 and Wave 2, which is a nationally representative, longitudinal survey of 43,093 United States residents conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA).^{21,22} Wave 1 of the survey was conducted in 2001-2002, with Wave 2 conducted in 2004-2005. Blacks and Latinos were oversampled. The survey assesses 16 mood, anxiety and personality disorders, as well as alcohol and substance use and alcohol use and substance use disorders, using questions based on the Alcohol Use Disorder and Associated Disability Interview Schedule-IV, a structured diagnostic interview schedule with good reliability and validity in general population samples. Substance use is ascertained in the NESARC for the following classes of substances: alcohol; sedatives, tranquilizers, painkillers, stimulants; marijuana; cocaine, hallucinogens, inhalants, heroin; other medications and drugs including psychoactive drugs and steroids, and tobacco.²¹

A total of 34,653 participants completed both waves of the survey, of whom 3,081 lived in states either with full SUD parity or with no SUD parity. Our primary analytic population consisted of 1,571 individuals who reported past year substance use, not including tobacco use, at baseline, but had not received SUD treatment in the year prior to the baseline interview. Within this sample we also separately analyzed 1) individuals with alcohol use and no illicit drug use, and 2) individuals with illicit drug use with or without alcohol use. Next we analyzed individuals with a lifetime history of AUD and/or illicit DUD and current use. Within this subsample we also separately analyzed 1)

individuals with a lifetime history of AUD and no illicit DUD history and current use, and 2) individuals with a lifetime history of illicit DUD and current use, with or without a history of AUD [Table 1]. Individuals with a lifetime history of AUD or illicit DUD were theorized to be more likely to initiate treatment because of their history of more severe alcohol and/or drug use behavior.

2.2 EXPOSURE (*Independent Variable*)

Our primary exposure was the parity status of each participant's state of residence in 2001-2005. We defined **parity** as:

The state requires insurers to cover SUD treatment at the same levels as they do for medical and surgical treatments. (*States: Connecticut, Delaware, Maryland, Vermont*)

We defined **partial parity** as:

The state requires insurers to cover SUD treatment, but they may do so at a level not equivalent to medical and surgical treatments. (*States: Arkansas, Hawaii, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Montana, Nevada, North Dakota, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Washington*)

We defined **weak parity** as:

The state may require insurers to cover specific SUDs but not all, may do so at a level not equivalent to medical and surgical treatments, or may only require certain levels of offerings for those insurers that choose to offer coverage. (*States: Alabama, California, Colorado, Florida, Georgia, Illinois, Mississippi, Missouri,*

Nebraska, New Jersey, New Mexico, New York, North Carolina, Ohio, South Carolina, South Dakota, Utah)

We defined **no parity** as:

The state neither requires insurers to cover SUD treatment nor does it stipulate to what levels SUD treatment must be covered if insurers choose to offer coverage.

(States: Arizona, Idaho, Iowa, Oklahoma, Wyoming)

We compiled information on state SUD parity laws from the Substance Abuse and Mental Health Services Administration¹⁸ as well as the National Conference of State Legislatures.²³ We resolved any inconsistencies by referring to the state statutes themselves where possible. Our results are generally consistent with previous literature.²⁴ We have provided a complete listing of all state parity laws that we reviewed and where possible we have listed the statute number and provided links (See Appendix). We then characterized each state law according to our parity definitions. States with full parity and those with no parity were hypothesized to have the strongest potential difference in SUD treatment initiation between the baseline (wave 1) and follow-up (wave 2) interviews. Consequently, these were the states that were included in our principal analyses.

2.3 OUTCOME (Dependent Variable)

Our outcome of interest was any self-reported incident SUD treatment episode between Wave 1 and Wave 2 interviews of any one of the following treatment types: alcohol/drug detoxification ward/clinic; inpatient ward of psychiatric/general hospital or community mental health program; outpatient clinic (including day/partial patient programs); alcohol/drug rehabilitation program; emergency room; halfway

house/therapeutic community; crisis center; private physician, psychiatrist, psychologist, social worker, or any other professional; any other agency/professional; and/or methadone maintenance program. We did not include 12-step treatment initiation in our outcome, because the research focus was the assessment of treatment initiation that would require insurance coverage.

2.4 ANALYSES

We used propensity score weighting to improve comparability of individuals in parity states compared to individuals in states without parity. We estimated the probability of living in a state with parity, partial parity, weak parity and no parity given an individual's age, sex, ethnicity, race, education, employment status, household income, marital status and survey weight using generalized boosted models.^{25,26} We generated inverse probability of treatments weights (IPTWs) and stabilized them by the marginal probabilities of living in parity, partial parity, weak parity and non-parity states according to each individual's state of residence. Survey weights were multiplied by the IPTWs, and logistic regression, accounting for the complexity of the survey design and structure, was used to assess SUD treatment initiation at follow-up among those living in states with SUD parity relative to those without parity for each of our analytic populations. All analyses were run in R Version 3.2.5 with the 'survey' and 'twang' packages. To assess the effectiveness of the IPTW in balancing the composition of the individuals residing in parity as compared with non-parity states, we compared the characteristics of the groups before and after applying the combined weights.

Application of inverse probability of treatment weighting in these analyses was quite successful as the groups in analyses under different treatment conditions were similar with respect to the observed characteristics after applying the weights.

3. RESULTS

Among 16,344 participants with substance use at baseline, 693 lived in states with parity and 878 lived in states without parity. Individuals in states with no parity were significantly more likely to be Hispanic (21.2% to 8.2%), white (90.9% to 72.7%), employed or seeking employment (76.8% to 72.6%), and have a lower household income (56.7% with income less than \$49,999 compared to 44.9%), but less likely to have completed college (38% to 49%) [Table 2]. After applying IPTWs, the individuals in states with no parity were only statistically significantly different from individuals in states with parity on ethnicity ($p=0.039$) [Table 3].

The adjusted odds (taking into account the IPTW) of entering treatment between waves 1 and 2 for those reporting past year substance use (alcohol and/or illicit drug use) in parity states was 1.55 times higher than the odds of those in states with no parity (95% CI: 0.63 to 3.81). For those reporting past year alcohol use (no illicit drug use), the adjusted odds of entering treatment in states with parity was 1.38 times higher than in states with no parity (95% CI: 0.49 to 3.86). For those reporting past year illicit drug use, the adjusted odds of entering treatment in states with parity was 1.04 times higher than in states without parity (95% CI: 0.36 to 2.96) [Table 5].

For individuals with a lifetime history of SUD (AUD and/or illicit DUD) at baseline, the adjusted odds of entering into substance use treatment between waves 1 and 2 in states with parity was 1.69 times higher than in states with no parity (95% CI: 0.81 to 3.54). For individuals with a lifetime history of AUD (without history of other SUD), the adjusted odds of entering into substance use treatment between waves 1 and 2 in states with parity was 4.61 times higher than in states with no parity (95% CI: 1.27 to 16.77).

For individuals with a lifetime history of illicit DUD, the adjusted odds of entering into substance use treatment between waves 1 and 2 in states with parity was 1.24 times higher than in states with no parity (95% CI: 0.44 to 3.48).

In supplemental analyses, we assessed treatment initiation for individuals with substance use and lifetime AUD and/or illicit DUD residing in states with partial and weak parity laws compared to those living in states with no parity. No appreciable associations of state residence with partial or weak parity with substance use treatment initiation were found in any of the supplemental analyses.

4. DISCUSSION

Living in a state with full parity had a positive association with SUD treatment initiation among substance users relative to those living in states without parity, although this association only met criteria for statistical significance among those with a lifetime history of AUD and not with other SUDs. These findings suggest that the inclusion of parity measures for SUD treatment within the PPACA have the potential to result in increased service initiation for substance users, particularly for those with lifetime history of AUD.

Limited research has examined the effect of parity legislation on SUD treatment initiation. In a previous study, Wen et al. did find that the implementation of a parity law increased facility SUD treatment rates by 9%.²⁴ That study was focused on facility rates, and not treatment seeking at the individual level. As such, Wen and colleagues' study was limited to specific types of treatment facilities, only including specialty SUD treatment facilities, and could not account for multiple visits by a single individual different treatment facilities outside a single course of treatment. We did not detect a similar increase in incident SUD treatment initiation at the individual level among all substance users in the current study, likely due to limited power. McConnell et al., examining Oregon's 2007 parity legislation, found increased alcohol treatment expenditures but no changes for other substances, which is consistent with our finding of larger effect sizes for alcohol users or substance users with lifetime history of AUD.²⁷ In a supplemental analysis, we found that substance users with a lifetime history of AUD (and no history of illicit DUD) were significantly more likely to have completed college, less likely to be unemployed and looking for a job, and reported higher household income

compared to substance users with a lifetime history of illicit DUD. These characteristics may make substance users with a lifetime history of AUD more likely to be insured and therefore more likely to enter treatment with increased mandated coverage.

A main strength of the present study is its use of a nationally representative sample to expand on previous literature that examined only subpopulations or state-specific effects. Additionally, whereas the only previous national study of which we are aware, was limited to facility level effects. Our study was able to link parity laws to an increase in the number of individuals accessing treatment, and was able to assess the incidence of treatment initiation over time, utilizing the prospective study design of the NESARC.

Due to a limited number of states whose parity status changed between the two waves of the NESARC, we were unable to test the effect of the implementation of a parity law on substance use treatment initiation. Instead, our framework compared initiation of treatment in states with parity to states without parity, which leaves the potential for confounding by state implementation. Although our IPTW weighting method adjusts for some of these differences, there is the possibility of residual confounding. Also, even using this framework, there was still a relatively small sample of substance users in the parity states, which reduced our power to detect small effects.

In summary, we found evidence that SUD parity legislation is associated with an increase in SUD treatment initiation, particularly among those with only an AUD. As the discussion on healthcare reform continues to evolve, our findings lend additional support to the maintenance of parity provisions for SUD treatment in future legislation. Further work needs to examine the effect of SUD parity legislation in larger datasets with

potentially more power, as well as to probe the effects of mandatory offering and minimum mandated benefits laws.

5. TABLES

TABLE 1. INCLUSIONS AND EXCLUSIONS

Total Individuals in Waves 1 & 2 of the NESARC: 34,653	
Excluded States with changes in parity status: Alaska, Maine, New Hampshire, Virginia, West Virginia, Wisconsin (n=2,129)	32,524 remaining
Exclude individuals not in parity/no parity states (n=29,443)	3,081 remaining
Exclude individuals currently in treatment at baseline (n=37)	3,044 remaining
Analytic Samples	
1) Alcohol and/or substance use (primary analytic sample)	1,571
1.1) Alcohol use, no other substance use	1,400
1.2) Other substance use, with or without alcohol use	171
2) Lifetime history AUD and/or SUD and current use	747
2.1) Lifetime history AUD, no other SUD history and current use	504
2.2) Lifetime history other SUD and current use, with or without history of AUD	243

TABLE 2: STUDY POPULATION CHARACTERISTICS

	Parity n=693	No Parity n=878	P- value
Birth Year (mean)	1957	1958	0.101
Female (%)	50.5	48.2	0.36
Hispanic (%)	8.2	21.2	<0.001
Race (%)			<0.001
White	72.7	90.9	
American Indian	0.7	1.8	
Asian	2.2	0.7	
African American	21.5	3.5	
Pacific Islander	0.8	0.3	
Mixed Race	2.2	2.7	
Education (%)			<0.001
Less than high school	0.07	0.11	
Completed high school / GED	0.23	0.27	
Some college	0.21	0.24	
College or greater	0.49	0.38	
Employment (%)			0.017
Employed	70.1	73	
Unemployed (seeking employment)	2.5	3.8	
Unemployed (not seeking employment)	21.8	20.4	
Other	5.6	2.8	
Household Income (%)			<0.001
<25,000	16.5	25.9	
25,000-49,999	28.4	30.8	
50,000-79,999	24.5	25.2	
>80,000	30.6	18.2	
Marital Status (%)			0.127
Married	49.5	54.7	
Living with someone as if married	4.6	4.4	
Widowed	4.6	4.2	
Divorced	12.4	13.8	
Separated	2.3	2.3	
Never married	26.6	20.6	

TABLE 3: IPTW WEIGHTED STUDY POPULATION CHARACTERISTICS

	Parity	No Parity	P-value
Birth Year (mean)	1956	1956	0.925
Female (%)	49.9	48.8	0.701
Hispanic (%)	12	16.3	0.039
Race (%)			0.229
White	81.3	85.1	
American Indian	0.9	1.5	
Asian	1.5	0.8	
African American	13.5	9.9	
Pacific Islander	0.5	0.3	
Mixed Race	2.3	2.4	
Education (%)			0.751
Less than high school	7.9	9.4	
Completed high school / GED	25.3	25.3	
Some college	21.9	22.4	
College or greater	45	42.9	
Employment (%)			0.407
Employed	71.6	72.6	
Unemployed (seeking employment)	2.6	3.7	
Unemployed (not seeking employment)	21.2	20.4	
Other	4.6	3.3	
Household Income (%)			0.316
<25,000	19.4	22.8	
25,000-49,999	29.9	30.7	
50,000-79,999	25.4	24.7	
>80,000	25.4	21.8	
Marital Status (%)			0.87
Married	51.5	53.6	
Living with someone as if married	4.4	4.3	
Widowed	4.2	4.6	
Divorced	12.7	13.4	
Separated	2.5	2.3	
Never married	24.8	21.7	

TABLE 4: UNADJUSTED ODDS RATIO OF TREATMENT INITIATION (PARITY VS. NON-PARITY)

	Odds Ratio	95% Confidence Interval
Past year substance use (n=1,571)	1.24	[0.65,2.36]
Past year alcohol use, no other drug use (n=1,400)	1.30	[0.51,3.31]
Past year drug use (n=171)	1.38	[0.49,3.86]
Lifetime history of SUD, with current substance use (n=747)	1.78	[0.85,1.78]
Lifetime history of AUD without history of other SUD, with current substance use (n=504)	3.97	[1.17,13.38]
Lifetime history of SUD with or without history of AUD, with current substance use (n=243)	1.16	[0.42,3.18]

TABLE 5: ADJUSTED ODDS RATIO OF TREATMENT INITIATION (PARITY VS. NON-PARITY)

	Odds Ratio	95% Confidence Interval
Past year substance use (n=1,571)	1.71	[0.70,4.20]
Past year alcohol use, no other drug use (n=1,400)	1.44	[0.53,3.93]
Past year drug use (n=171)	1.05	[0.36,3.06]
Lifetime history of SUD, with current substance use (n=747)	1.49	[0.71,3.14]
Lifetime history of AUD without history of other SUD, with current substance use (n=504)	4.61	[1.28,16.67]
Lifetime history of SUD with or without history of AUD, with current substance use (n=243)	1.07	[0.38,2.99]

6. APPENDIX

STATE SUD PARITY STATUTES^{18,23,24}

State	Statute	Date	Description	Insurance Type	Type
Alabama		1979	Alcoholism	Group and HMO	Mandated offering
Alaska	21.42.365	2004	Drug abuse and alcoholism	Group	Minimum mandated benefit
Alaska	21.54.151	2009	substance use disorder	Group and individual	Minimum mandated benefit
Arkansas	23.79.139	1987	Alcohol and drug dependency	Group and HMO	Mandated offering
Arkansas		1997		Group	Mandated offering
Arkansas	23.99.501-23.99.512	2009	Arkansas Mental Health Parity Act; substance use disorders	Group	Parity
California		1990	Alcohol	Group	
Colorado		1994	Alcohol	Group	Mandated offering
Colorado	10.16.104.7	2003	Substance abuse- court ordered treatment	Group and individual	Mandated offering
Connecticut	38a.488a-514	2000	Substance use disorders	Group and individual	Parity
Delaware		2001	Substance use disorders (amendment)		Parity
Florida	627.669	1993	Substance abuse	Group and HMO	Mandated offering
Georgia	33.24.28.1; 33.24.29.1	1998	Substance abuse	Group and individual	Mandated offering
Hawaii	431M.1-431M.7	1988	Alcohol and drug abuse	Group and individual	

Hawaii	SB 761	2005	HI Laws Act 140 (amendment)		
Illinois		1995	Alcohol		Minimum mandated benefit
Indiana	27.13.7.14. 27.8.5.15.6	2003	Indiana House Enrolled Act 1135 (Amendment)	Group, HMOs and individual	Minimum mandated benefit
Kansas		1998			Minimum mandated benefit
Kansas		2002			Minimum mandated benefit
Kansas	40.2, 105; 40-2, 105a	2009	Kansas Mental Health Parity Act; alcohol and drug abuse		Minimum mandated benefit
Kentucky		1980	Alcohol		Mandated offering
Kentucky		2000	Substance use disorders		Mandated offering
Louisiana		1982	Substance use disorders	Group	Mandated offering
Louisiana	R.S.22:102 5	2009	Alcoholism, drug abuse	Group	Mandated offering
Maine	T.24.A 284 2	1984	Alcoholism, drug dependency	Group	Minimum mandated benefit
Maine		2003	Substance use disorders (amendment)		Parity
Maryland		1994		Group and individual	Minimum mandated benefit
Maryland	INS 15.802	1997		Group and individual	Parity
Maryland		2002	Expansion	Group, HMOs, and individual	Parity

Massachusetts		1991	Alcoholism	Group, HMOs and individual	Minimum mandated benefit
Massachusetts		2001	Substance use disorders	Group, HMOs and individual	Minimum mandated benefit
Michigan	550.1414a	1982	Substance abuse	Group, HMOs and individual	Minimum mandated benefit
Michigan		2001	Substance use disorders		Minimum mandated benefit
Minnesota		1986	Substance use disorders		Minimum mandated benefit
Minnesota		1995	Substance use disorders	Group, HMOs and individual	Parity?
Minnesota	62A.152	1999	Chemical dependence	Group, HMOs and individual	Mandated offering
Mississippi	83-9-27; 83-9-29	1975	Alcoholism treatment	Group	Minimum mandated benefit
Missouri		1995	Substance use disorders	Group and individual	Minimum mandated benefit (alcohol); mandated offering (chemical dependence)
Missouri		1997			Mandated offering
Missouri		2000			Mandated offering
Missouri	376.811; 376.825- 376.840; 376.1550	2015	Mental Health and Chemical Dependency Insurance Act	Group and individual	Minimum mandated benefit
Montana	33.22.701- 705	1987	Alcoholism, drug addiction	Group	Minimum mandated benefit
Montana		1997		Group	Minimum mandated benefit

Montana		2001	Substance use	Group	Minimum mandated benefit
Nebraska	44-780	1980	Alcoholism	Group and HMO	Minimum mandated benefit
Nebraska		1989			Mandated offering
Nevada	689A.046; 689C.167	1979 (Eff.)	Abuse of alcohol and other drugs	Group and individual	Minimum mandated benefit
Nevada		1997	Substance use disorders		Minimum mandated benefit
New Hampshire		2003	Substance use disorder (amendment)		Minimum mandated benefit
New Jersey	17:48-6a; 17:48A-7a; 17:48E-34; 17B:26-2.1	1985	Alcohol	Group and individual	Minimum mandated benefit
New Jersey		2002	Substance use disorders		Mandated offering
New Mexico		1987	Alcoholism		Mandated offering
New Mexico	59A-23-6; 59A-47-35	1999	Alcohol dependency	Group	Mandated offering
New York		1998	Substance use disorders	Group	Mandated offering
New York	3221(1)(5) (A)	2011	Alcoholism and substance abuse	Group	Mandated offering
N Carolina		1985	Substance use disorders	Group	Mandated offering
N Dakota	26.1-36-08	1985	Alcoholism and drug addiction	Group and HMO	Minimum mandated benefit
N Dakota		2003	Substance use disorders (amendment)	Group and HMO	Minimum mandated benefit

Ohio	3923.30	1979	Alcoholism	Group and self-insured	Minimum mandated benefit
Ohio		1985	Alcoholism	Group and self-insured	Minimum mandated benefit/mandated offering
Oregon		1981	Alcohol	Individual	Mandated offering
Oregon		2000	Substance use disorders	Group and HMO	Minimum mandated benefit
Oregon	743A.168; 743.556	2007	Chemical dependency	Group and HMO	Minimum mandated benefit
Pennsylvania		1989	Substance use disorders		Minimum mandated benefit
Pennsylvania	40 908-1 to 908-8	1990	Alcohol abuse and dependency	Group and HMO	Minimum mandated benefit
Rhode Island		2002	(Amendment)	Group	Minimum mandated benefit
S Carolina	38-71-737	1976	Substance abuse	Group	Mandated offering
S Carolina		1994	Substance use disorders		Mandated offering
S Dakota		1979	Alcohol		Mandated offering
Tennessee	56-7-2602	1982	Chemical dependency	Group	Mandated offering
Texas		1981	Substance use disorders		Minimum mandated benefit/mandated offering
Texas	Chap.1368	2005	Chemical dependency	Group and self-insured	Minimum mandated benefit
Utah		1994	Substance use disorders	Group	Mandated offering
Vermont		1998	Substance use disorders		Parity

Vermont	8.4089b	2011	Substance abuse		Parity
Virginia		2000	Substance use disorders	Group and individual	Parity
Virginia		2004	Substance use disorders (replaces 2000 law)	Group, HMO and individual	Minimum mandated benefits
Washington	Chapter 284-53	1988	WAC Standards for Coverage of Chemical Dependency	Group	Minimum mandated benefit
W Virginia		1998	Alcoholism		Mandated offering
Wisconsin		2004			Mandated offering
Wisconsin	632.89	2010	Alcoholism	Group	Minimum mandated benefit

7. REFERENCES

1. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5). *Diagnostic Stat Man Ment Disord 4th Ed TR*. 2013;280. doi:10.1176/appi.books.9780890425596.744053.
2. Center for Behavioral Health Statistics and Quality., (2016). Key substance use and mental health indicators in the United States: Results from the 2015 National Survey on Drug Use and Health. 2016:Publication No. SMA 16-4984, NSDUH Series H-51). doi:(HHS Publication No. SMA 16-4984, NSDUH Series H-51.
3. Stone AL, Becker LG, Huber AM, Catalano RF. Review of risk and protective factors of substance use and problem use in emerging adulthood. *Addict Behav*. 2012;37(7):747-775. doi:10.1016/j.addbeh.2012.02.014.
4. Fesahazion RG, Thorpe RJ, Bell CN, LaVeist TA. Disparities in alcohol use: Does race matter as much as place? *Prev Med (Baltim)*. 2012;55(5):482-484. doi:10.1016/j.ypmed.2012.08.007.
5. Chartier KG, Hesselbrock MN, Hesselbrock VM. Alcohol problems in young adults transitioning from adolescence to adulthood: The association with race and gender. *Addict Behav*. 2011;36(3):167-174. doi:10.1016/j.addbeh.2010.10.007.
6. Alvanzo AAH, Storr CL, La Flair L, Green KM, Wagner FA, Crum RM. Race/ethnicity and sex differences in progression from drinking initiation to the development of alcohol dependence. *Drug Alcohol Depend*. 2011;118(2-3):375-382. doi:10.1016/j.drugaldep.2011.04.024.
7. Merikangas KR, McClair VL. Epidemiology of substance use disorders. *Hum Genet*. 2012;131(6):779-789. doi:10.1007/s00439-012-1168-0.

8. Grant BF, Goldstein RB, Chou SP, et al. Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Mol Psychiatry*. 2009;14(11):1051-1066. doi:10.1038/mp.2008.41.
9. Grant BF, Stinson FS, Dawson DA, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2004;61(8):807-816. doi:10.1001/archpsyc.61.8.807.
10. Room R, Babor T, Rehm J. Alcohol and public health. *Lancet (London, England)*. 2005;365(9458):519-530. doi:10.1016/S0140-6736(05)17870-2.
11. National Drug Intelligence Center. National Drug Threat Assessment 2016. 2016. <https://www.dea.gov/resource-center/2016-NDTA-Summary.pdf>.
12. Edlund MJ, Booth BM, Han X. Who seeks care where? Utilization of mental health and substance use disorder treatment in two national samples of individuals with alcohol use disorders. *J Stud Alcohol Drugs*. 2012;73(4):635-646. <http://www.scopus.com/inward/record.url?eid=2-s2.0-84862152212&partnerID=tZOtx3y1>.
13. Harris KM, Edlund MJ. Use of mental health care and substance abuse treatment among adults with co-occurring disorders. *Psychiatr Serv*. 2005;56(8):954-959. doi:10.1176/appi.ps.56.8.954.
14. Chen L-Y, Crum RM, Martins SS, Kaufmann CN, Strain EC, Mojtabai R. Service use and barriers to mental health care among adults with major depression and

- comorbid substance dependence. *Psychiatr Serv.* 2013;64(9):863-870.
doi:10.1176/appi.ps.201200289.
15. Strang J, Babor T, Caulkins J, Fischer B, Foxcroft D, Humphreys K. Drug policy and the public good: evidence for effective interventions. *Lancet (London, England).* 2012;379(9810):71-83. doi:10.1016/S0140-6736(11)61674-7.
 16. Chen L-Y, Strain EC, Crum RM, Mojtabai R. Gender Differences in Substance Abuse Treatment and Barriers to Care Among Persons With Substance Use Disorders With and Without Comorbid Major Depression. *J Addict Med.* 2013;7(5):325-334. doi:10.1097/ADM.0b013e31829b7afe.
 17. Kaufmann CN, Chen L-Y, Crum RM, Mojtabai R. Treatment seeking and barriers to treatment for alcohol use in persons with alcohol use disorders and comorbid mood or anxiety disorders. *Soc Psychiatry Psychiatr Epidemiol.* 2014;49(9):1489-1499. doi:10.1007/s00127-013-0740-9.
 18. Robinson GK, Connolly JB, Whitter M, Magana CA. *State Mandates for Treatment for Mental Illness and Substance Use Disorders.* Washington, DC; 2007. <https://samhsa.gov>.
 19. Barry CL, Huskamp HA, Goldman HH. A political history of federal mental health and addiction insurance parity. *Milbank Q.* 2010;88(3):404-433.
doi:10.1111/j.1468-0009.2010.00605.x.
 20. Department of Health. Patient Protection and Affordable Care Act; standards related to essential health benefits, actuarial value and accreditation. Final rule. *Fed Regist.* 2013;78(37):12833-12872. <https://www.gpo.gov/fdsys/pkg/FR-2013-02-25/pdf/2013-04084.pdf>.

21. Grant BF, Dawson DA. Introduction to the National Epidemiologic Survey on Alcohol and Related Conditions. National Institute on Alcohol Abuse and Alcoholism. <http://pubs.niaaa.nih.gov/publications/arh29-2/74-78.htm>. Accessed March 9, 2016.
22. Grant BF, Kaplan K. *Source and Accuracy Statement for the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)*. Rockville, MD; 2005.
23. Cauchi R, Hanson K, Landess S, Thangasamy A. No Title. National Conference of State Legislatures. <http://www.ncsl.org/research/health/mental-health-benefits-state-mandates.aspx>. Published 2015. Accessed March 9, 2017.
24. Wen H, Cummings JR, Hockenberry JM, Gaydos LM, Druss BG. State parity laws and access to treatment for substance use disorder in the United States: implications for federal parity legislation. *JAMA psychiatry*. 2013;70(12):1355-1362. doi:10.1001/jamapsychiatry.2013.2169.
25. Dugoff EH, Schuler M, Stuart EA. Generalizing observational study results: applying propensity score methods to complex surveys. *Health Serv Res*. 2014;49(1):284-303. doi:10.1111/1475-6773.12090.
26. McCaffrey DF, Griffin BA, Almirall D, Slaughter ME, Ramchand R, Burgette LF. A tutorial on propensity score estimation for multiple treatments using generalized boosted models. *Stat Med*. 2013;32(19):3388-3414. doi:10.1002/sim.5753.
27. McConnell KJ, Ridgely MS, McCarty D. What Oregon's parity law can tell us about the federal Mental Health Parity and Addiction Equity Act and spending on substance abuse treatment services. *Drug Alcohol Depend*. 2012;124(3):340-346.

doi:10.1016/j.drugalcdep.2012.02.006.

8. CURRICULUM VITAE

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Born April 5th, 1993 in Berkeley, CA

EDUCATION

August 2015-Present, Johns Hopkins Bloomberg School of Public Health

- Master of Science Candidate in Epidemiology (General Epidemiology and Methodology Track)

September 2011-June 2015, University of Chicago

- Bachelor of Science in Statistics

RESEARCH

Apr. 2016-Present, Johns Hopkins Bloomberg School of Public Health

Graduate Researcher, Advisor Dr. Rosa Crum (Co-PI Dr. Ramin Mojtabai)

- ScM thesis project: substance use disorder treatment and parity research
- Substance use comorbidity research

Mar. 2017-Present, Johns Hopkins Bloomberg School of Public Health

Graduate Research Assistant, Dr. Peter Zandi

- Bisulfite methylation sequencing analysis
 - Maternal diet effects on offspring methylation in *Rattus norvegicus*

- Effects of cortisol on methylation
- Familial sequencing analysis in MDD

TEACHING

Sep. 2016-Oct. 2016, Johns Hopkins Bloomberg School of Public Health

Teaching Assistant: PH.340.721 Epidemiologic Inference in Public Health

Oct. 2014-Mar. 2015, Jul. 2013-Aug. 2013, University of Chicago Dept. of Computer Science

Teaching Assistant: CMSC 15100-15200 Introduction to Computer Science I-II

POSTER PRESENTATIONS

Kealhofer, M., Krawczyk, N., Crum, R.M., and Mojtabai, R. The Impact of State Health Care Reforms on Initiation of Substance Use Disorder Treatment. Poster presented at the 2016 IPS: The Mental Health Services Conference. Washington, DC. October 2016.

PEER REVIEWED PUBLICATIONS

Krawczyk, N., Feder, K. A., Saloner, B., Crum, R. M., **Kealhofer, M.**, & Mojtabai, R. (2017). The association of psychiatric comorbidity with treatment completion among clients admitted to substance use treatment programs in a U.S. national sample. *Drug and Alcohol Dependence*, 175, 157-163. doi:10.1016/j.drugalcdep.2017.02.006