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State Variations in Medicaid Enrollment and Utilization of Substance Use Services: Results from a National Longitudinal Study

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Abstract

Medicaid enrollment varies considerably among states. This study examined the association of Medicaid enrollment with the use of substance health services in the longitudinal National Epidemiologic Survey on Alcohol and Related Conditions of 2001–2005. Instrumental variable methods were used to assess endogeneity of individual-level Medicaid enrollment using state-level data as instruments. Compared to the uninsured, Medicaid covered adults were more likely to use substance use disorder treatment services over the next three years. States that have opted to

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expand Medicaid enrollment under the Affordable Care Act will likely experience further increases in the use of these service over the coming years.

Keywords

Medicaid; service use; substance use treatment; instrumental variables

1. INTRODUCTION

Medicaid enrollment varies across the states considerably. In the years before the recent implementation of the Affordable Care Act (ACA), these variations were mainly due to 1115 waivers that allowed states to offer Medicaid to individuals who would not be eligible under traditional Medicaid programs, mostly low-income adults who did not meet the "categorical" requirements (Holahan, Coughlin, Ku, Lipson, & Rajan, 1995). These initiatives were further strengthened through the Bush Administration's Health Insurance Flexibility and Accountability (HIFA) initiative, which encouraged states to extend Medicaid to those with incomes below 200% of the Federal Poverty Level (FPL). As of January 2004, 19 states had implemented Medicaid expansion under 1115 waivers and another six, under the HIFA initiative (Baumrucker, 2004).

Partly as a result of these initiatives, the number of individuals enrolled in Medicaid increased from 9.5% of the non-elderly US population in 2000 to 16.9% in 2010 (National Center for Health Statistics, 2012). Several studies have examined the effect of these individual state Medicaid expansion programs on utilization of services for substance use disorders (SUD) (Callahan, Shepard, Beinecke, Larson, & Cavanaugh, 1995; Deck & McFarland, 2002; Deck, McFarland, Titus, Laws, & Gabriel, 2000; Deck, Wiitala, & Laws, 2006; Saunders & Heflinger, 2003). Among the various state Medicaid programs, those in Massachusetts, Oregon, Tennessee and California were most extensively studied. Overall, these programs have been successful in enrolling newly eligible participants and were, for the most part, associated with increased use of substance use disorder (SUD) services in the states that implemented the expansion programs. However, with few exceptions (Wen, Druss, & Cummings, 2015) little research has investigated the impact of these Medicaid expansion programs on the use of SUD services at a national level. These effects are important to examine because state variations in Medicaid enrollment are likely to persist or even deepen in years following the Supreme court's decision that made Medicaid expansion under the ACA optional for states (Berliner, 2013).

In this study, a large and nationally representative longitudinal survey of the US general population was used to examine the association of Medicaid enrollment with future use of SUD treatment services. More sepcifically, data from participants of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (Grant, Stinson, Dawson, Chou, Dufour, et al., 2004; Grant, Stinson, Dawson, Chou, Ruan, et al., 2004) were used to examine whether Medicaid enrollment at baseline was associated with the use of SUD services over the subsequent three-year follow-up.

NESARC remains the most recent longitudinal survey of the US population in which SUD and its treatments were assessed. Although the mix of SUDs has somewhat changed since the years when these data were collected, the prevalence of SUD treatment seeking and the financing and structure of SUD services have not changed markedly in this period (Han, Hedden, Lipari, Copello, & Kroutil, 2015; Mark et al., 2016). As a result, the findings would have relevance to the current debates about the benefits of expasion of Medicaid enrollement at a national level.

Insurance status may have a reciprocal relationship with service use (Rabinowitz, Bromet, Lavelle, Hornak, & Rosen, 2001), and therefore it may be "endogenous" in models assessing its association with service use. This is because service providers may help eligible individuals enroll in public insurance. Thus, individuals who used services in the past may be more likely to have enrolled in Medicaid and also use services in future. Without accurate information on the dates of enrollment in Medicaid and the first service contact it is not possible to adjust for this potential confounding effect.

The present analysis assessed the possible endogeneity of Medicaid insurance enrollment in the NESARC sample by applying instrumental variable techniques and using state-level variations in Medicaid enrollment as an instruments. Instrumental variable techniques address the issue of endogeneity by modeling individual-level Medicaid enrollment as a function of state-level prevalence of Medicaid enrollment. Assuming the validity of instruments, the "instrumented" or predicted individual-level Medicaid enrollment variable in these models would be free from the effect of prior service use or other individual-level factors that could confound the association with the outcomes. The use of state-level Medicaid enrollment instruments in this study is similar to past research that has used state variations in Medicaid eligibility and enrollment as instrumental variables to assess the association of public insurance enrollment with mortality in HIV infected individuals (Bhattacharya, Goldman, & Sood, 2003).

Specifically, in this study, we tested the hypothesis that Medicaid enrollment at baseline would be associated with increased use of SUD treatment services at follow-up. It was further hypothesized that this increase would be more marked for services that are typically covered by insurance (e.g., outpatient services) as compared to services that are not covered by insurance (e.g., 12-step programs).

2. MATERIAL AND METHODS

2.1. Sample

The design and the sample characteristics of the NESARC have been previously described (Grant et al., 2009; Grant, Stinson, Dawson, Chou, Dufour, et al., 2004; Grant, Stinson, Dawson, Chou, Ruan, et al., 2004; Hasin, Goodwin, Stinson, & Grant, 2005; Sareen et al., 2016). Briefly, the NESARC is a longitudinal survey of the US general population, including residents of Hawaii and Alaska, sponsored by the National Institute on Alcohol Abuse and Alcoholism. The survey aimed to examine prevalence and comorbidities of substance use and mental disorders in the country. The interviews were completed in face-to-face

encounters with the participants. The NESARC sample was weighted to adjust for the unequal probabilities of selection and to provide nationally representative estimates.

NESARC baseline (T1) was fielded between 2001 and 2002 and included 43,093 participants 18 years of age and older. Of these, 39,959 were eligible for follow-up (T2) interviews between 2004 and 2005. Ineligible respondents included those who at the time of the T2 interview were deceased, deported, mentally or physically impaired or on active military duty. A total of 34,625 eligible T1 participants were successfully interviewed in the T2 survey. The response rates for T1 and eligible T2 surveys were 81% and 87% respectively (Grant et al., 2009). Survey weights were adjusted to account for loss to follow-up at T2. The study sample was comprised of 10,216 participants who met the criteria for a lifetime DSM-IV SUD at T2 and who were asked questions about SUD treatment. Further sensitivity analyses were conducted in the full sample of 23,245 participants who were asked questions about SUD treatment irrespective of their SUD status.

2.2. Assessments

Health insurance status was assessed by a series of questions about current enrollment at interview. The questions included four types of enrollment: 1) Medicaid (or local name of the Medicaid insurance), 2) Medicare, 3) Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA), the US Department of Veteran Affairs (VA), or other military and, 4) health insurance obtained privately or through a current or former employer or union. Participants who did not endorse any of these insurance types were rated as uninsured.

The use of SUD treatment services between T1 and T2 was ascertained by the following question: “Since your last interview in *(month/year)*, have you gone anywhere or seen anyone for a reason that was related in any way to your (drinking/use of medicines or drugs)—a physician, counselor, Alcoholics Anonymous, or any other community agency or professional?” Those who responded positively were then asked about different types of services, including: Alcoholics Anonymous, Narcotics or Cocaine Anonymous or any other 12-step meeting, family services or another social service, alcohol or drug detoxification ward or clinic, inpatient ward of a psychiatric or general hospital or community mental health program, outpatient clinic, including outreach programs and day or partial patient programs, alcohol or drug rehabilitation program, methadone maintenance program (asked only from people reporting non-alcohol drug use), emergency room, half-way house or therapeutic community, crisis center, Employee Assistance Program (EAP), clergy, priest rabbi, or any type of religious counselor, private physician, psychiatrist, psychologist, social worker, or any other professional and any other agency or professional. Questions about service use were asked only of participants who reported using alcohol or drugs between T1 and T2 and endorsed at least one of the symptoms of SUD in Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) (American Psychiatric Association, 1994). SUD treatments were categorized into those that are typically covered by health insurance (e.g., outpatient services, hospitalization) and those that are not covered by insurance (e.g., Alcoholic Anonymous, social services).

SUDs were ascertained at both T1 and T2 using AUDADIS-IV. For this study, SUDs included abuse and dependence according to the DSM-IV criteria, involving alcohol, cannabis, crack/cocaine, hallucinogens, sedatives, tranquilizers, stimulants, heroin and other narcotics. The surveys also ascertained whether the respondent had met the criteria in the past year or before the past year.

Sociodemographic variables including sex, age, race-ethnicity (non-Hispanic white, non-Hispanic black, Hispanic and other), personal income, and state of residence were ascertained and included in the multivariable analyses.

2.3. Analysis

Analyses were conducted in three stages. In the first stage, the instrumental variable method of bivariate probit analysis (Bhattacharya, Goldman, & McCaffrey, 2006) was used to examine the association of Medicaid enrollment at T1 with SUD treatments during the time period between T1 and T2. The bivariate probit analysis model can be specified by the following simplified structural model (Waters, 1999):

$$M_i^* = \beta \boldsymbol{X}_i + \alpha y_i + \varepsilon_1 \quad (1)$$

In which the latent variable of treatment (M_i^*) is a linear function of the exogenous variables ($\boldsymbol{X}$) (e.g., sex, age) and a potentially endogenous variable (y), in this case Medicaid enrollment. Whether or not the individual actually receives treatment (M_i) is determined as follows:

$$M_i = \begin{cases} 1 \textit{ individual i receives treatment} & \textit{if } M_i^* > 0 \\ 0 \textit{ individual i dose not receives treatment} & \textit{if otherwise} \end{cases} \quad (2)$$

The model for the endogenous variable is specified by the following equation:

$$y_i^* = \gamma \mathbf{X}_i + \delta \mathbf{Z}_i + \varepsilon_2 \quad (3)$$

In which, y_i^* is the latent variable of the propensity of the individual to be enrolled in Medicaid and is a linear function of the exogenous variables in the model ($\boldsymbol{X}$), as well as the identifying instrumental variables ($\mathbf{Z}$), which in this case are state-level variables.

The observed y_i is a function of the value of y_i^* as follows:

$$y_i = \begin{cases} 1 \textit{ individual i has Medicaid} & \textit{if } y_i^* > 0 \\ 0 \textit{ individual i dose not have Medicaid} & \textit{if otherwise} \end{cases} \quad (4)$$

The instrumental variables representing state-level enrollment in Medicaid in years 2001–2002 (corresponding to the years of NESARC T1 interview) were extracted from a report by the Kaiser Commission on Medicaid and the Uninsured (Hoffman & Wang, 2003) (Appendix Table A). Two variables based on these data were used: 1) the overall proportion of low-income residents of each state, defined by income <200% of the FPL, covered by Medicaid, and 2) the proportion of low-income residents in each state covered by Medicaid out of those either covered by Medicaid or uninsured. The second variable thus excluded individuals with other types of insurance.

Selection of instruments in instrumental variable analysis is based on the assumptions that the instruments are a) associated with the putative causal variable that is "instrumented" (in this case, individual Medicaid enrollment status), b) are exogenous in the regression model after adjusting for potential confounders (i.e., uncorrelated with the error term of the regression model), and c) associated with the outcomes of interest only through the instrumented variable. While the assumptions a and b can be tested empirically (see below), assumption c cannot be tested (Morgan & Winship, 2007).

Most importantly, the choice of the instrumental variables should be based on theoretical justifications. State variations in Medicaid enrollment are often determined by political and fiscal factors at the state level, few of which are directly related to state prevalence of SUD or need for SUD services because only a very small proportion of Medicaid spending is for SUD services. For example, in 2005 only 1.5 percent of Medicaid spending was for SUD treatment services (Mark, Levit, Vandivort-Warren, Buck, & Coffey, 2011). Nevertheless, Medicaid was the second largest payer for SUD services in this period (Mark et al., 2011). Thus, it is reasonable to assume that Medicaid enrollment would have an impact on SUD service use; whereas, availability or unmet need for SUD services would not be major drivers of state Medicaid policy.

There is also strong evidence that being enrolled in Medicaid is associated with increased use of health services in general (Gunja, Collins, Blumenthal, Doty, & Beutel, 2017), and mental health services, in particular (Deck & Ley, 2006; Frank, Goldman, & Hogan, 2003; Wen et al., 2015). However, the evidence for impact on SUD services is more limited (Wen et al., 2015; Zur & Mojtabai, 2013).

Furthermore, many of the individuals who are enrolled in Medicaid would have otherwise remained uninsured due to low income, unemployment or employment at jobs without health insurance (Bovbjerg, Hadley, Pohl, & Rockmore, 2002; Haber, Khatutsky, & Mitchell, 2000). The major target of the Medicaid expansion programs under 1115 waivers is to expand coverage to these low-income uninsured adults.

Therefore, we opted to use two instrumental variables: the percentage of low income adults enrolled in Medicaid among *all* low-income adults and the percentage among those who, without Medicaid *would likely have remained* uninsured. Thus, the latter variable captures the group of low-income adults targeted by Medicaid expansion programs more specifically.

The association of these state-level variables with the individual level variable of Medicaid enrollment is intuitive. Individuals who live in a state with a larger percentage of adults

enrolled in Medicaid (a proxy for the states' generosity in offering Medicaid insurance) would naturally be more likely to be enrolled in Medicaid. Indeed, this association was substantiated empirically as well (see below).

Using two instrumental variables also allowed us to conduct over-identification tests to assess whether the instrumental variables are associated with the error terms of the regression models. Following common practice (French & Popovici, 2009; Guilkey & Lance, 2014), the overidentification test was conducted by repeating the bivariate probit analysis with one of the two state-level variables as an instrumental variable and entering the other state-level variable as an independent variable in the models. Variables representing respondent sex, age, race/ethnicity, income, and SUD in the past year (at T1), other types of insurance enrollment (with the uninsured as the reference category) and dummy-coded variables for individual states were also included in the models. A significant association between the tested variable and the outcome in these models would indicate that the tested variable is not exogenous and not suitable as an instrumental variable.

The strength of the association of the state-level instrumental variables with individual Medicaid enrollment was assessed using adjusted F-tests. Values smaller than 10 suggest weak instruments (Staiger & Stock, 1997).

While instrumental variable models provide advantages over naïve regression models, they typically lead to a loss of efficiency by producing large standard errors. The need for using instrumental variable models can be assessed by examining the *rho* coefficients from these models which represent the correlations between the error terms of the two parts of the model (ϵ_1 *and* ϵ_2 *in* [1] *and* [2] *above*) and the endogeneity of individual-level Medicaid enrollment in these models. A large and statistically significant *rho* value indicates endogeneity and justifies the use of instrumental variable models. If *rho* is small and not statistically significant, it suggests that the putative casual variable (individual Medicaid enrollment status) is not endogenous in the model, and that the use of an instrumental variable model–which results in a loss of efficiency as compared to a naïve model–is unnecessary. The technical details of the of the bivariate probit model and its advantages over other instrumental variable models have been presented elsewhere (Bhattacharya et al., 2006).

In the second stage of the analyses, a naïve probit model in which individual Medicaid status at T1 was assumed to be exogenous (based on *rho* values) was used. The naïve probit model adjusted for the same set of variables used in the bivariate probit. While the samples for the bivariate and naïve probit analyses reported here were limited to adults with lifetime SUD, these analyses were repeated in the full sample of adults who responded to questions about the use of SUD services.

In the third stage of the analyses, the associations of T1 Medicaid enrollment with different types of SUD treatments were assessed using multivariable logistic regression models that adjusted for the same individual-level variables as in the probit models described above. The association of Medicaid enrollment with each individual service and with each of two

general types of SUD treatment (i.e., typically covered by insurance and not covered) were assessed.

All analyses were conducted using the STATA 14 software (StataCorp, 2015) and adjusted for survey weights, clustering, and stratification of data. Bivariate probit analyses were conducted using the *biprobit* routine of Stata. All percentages reported are weighted. A p<. 05 was used to determine statistical significance of tests.

3. RESULTS

3.1. Characteristics of the participants with SUD

The majority of NESARC participants in the study sample were male, younger than 40 years of age, non-Hispanic white, and had a personal income of less than $35,000 per year (Table 1). A total of 42.2% met the full criteria for an SUD in the past year and 4.4% were covered by Medicaid.

3.2. Association of Medicaid enrollment with the use of SUD treatments

Table 2 present the results of bivariate and naïve probit models for the association of Medicaid enrollment at T1 with receipt of SUD treatments between T1 and T2 (Appendix Table B presents full table with dummy-coded state variables). The instrumental variables were significantly associated with individual Medicaid enrollment status, with F-test values exceeding 10 (F [2, 64]=12.29, p<.001 for the joint test of these variables in the model). The F-test values for each individual instrument in the just-identified models were similarly high. Neither of the overidentification tests were significant, supporting the validity of the instrumental variables (Appendix Table B). However, the *rho* coefficient in the model was relatively small and not different from 0 at a statistically significant level, suggesting that the individual-level Medicaid status is not endogenous in the model and instrumental variable modeling is not necessary to obtain unbiased estimates of the association of Medicaid enrollment with SUD treatment. The reduced form regression coefficient for the *instrumented* individual-level Medicaid variable was not statistically significant due to the inefficiency of the model.

Therefore, a naïve probit analysis was conducted. As a further test of unbiasedness of the naïve model results the predicted values from the bivariate probit model as well as the naïve probit model were computed. Comparison of these predicted probabilities revealed remarkable consistency. The predicted probabilities for receipt of SUD treatment were 8.1% for those with Medicaid vs. with 5.1% in the uninsured (risk difference=2.9%) in both the bivariate and naïve probit models. This finding further supports the use of the more efficient naïve probit model.

The probabilities of service use among participants with and without Medicaid enrollment at T1 are presented in Figure 1. In addition to Medicaid insurance, past-year SUD was associated with greater likelihood of SUD treatment; whereas, private insurance, female sex, age 55 and older, and annual personal income of $35,000 or more were associated with lower likelihood of receiving such treatment. The associations of private insurance and income with SUD treatment may reflect the social consequences of more severe SUD which

in turn is associated with greater likelihood of using services. The results of bivariate and naïve probit analyses for the full sample of participants who were asked about SUD service were very similar to the analyses for participants with lifetime SUD (Appendix Table C).

3.3. Types of services

The adjusted comparisons of the use of various types of services are presented in Table 3. Compared to the uninsured, participants with Medicaid had higher odds of receiving SUD treatments that are potentially covered by health insurance, such as detoxification and rehabilitation services. However, Medicaid-covered participants were not more likely than the uninsured to receive treatments not covered by insurance, such as 12-step, with the exception of family and social services, which was more commonly used by individuals with Medicaid.

4. DISCUSSION

Medicaid remains the largest source of public funding for SUD services in the US (Mark et al., 2016). However, there have been significant variations in the eligibility criteria and enrollment in Medicaid across the states. As these variations are likely to continue or even increase in near future (Berliner, 2013), it is important to understand how policies that expand access to Medicaid affect SUD service use. Our findings indicate that Medicaid enrollment is significantly associated with the use of SUD treatment services, thus state policies that impact Medicaid enrollment would have an impact on SUD service use.

This finding has implications for future developments in Medicaid enrollment across states. As a large proportion of new enrollees under the ACA will have SUDs (Busch, Meara, Huskamp, & Barry, 2013; Tsai, Pilver, & Hoff, 2014), variations in Medicaid enrollment across states will likely contribute to growing disparities in service use in these individuals. Our findings also suggest that disparities in the treatment of SUD will be mainly for formal treatment services that are typically covered by health insurance such as outpatient, residential, and medication- assisted treatments. These are the services that have the strongest evidence base and should therefore be made more accessible to persons in need of treatment (Glasner-Edwards & Rawson, 2010).

A further finding of the study was the negative association of private health insurance with SUD treatment use. This finding is consistent with past research (Ali, Teich, & Mutter, 2015; Becker et al., 2008) and may be attributable to less severe impairment in privately insured individuals with SUD who typically obtained their health insurance through employment, or to the different set of barriers to SUD treatment that these individuals face (Ali, Teich, & Mutter, 2017).

The results of this longitudinal study are consistent with previous studies that found associations between individual state Medicaid extension initiatives and SUD service use (Callahan et al., 1995; Deck & McFarland, 2002; Deck et al., 2000; Deck et al., 2006; Saunders & Heflinger, 2003). The present study provides nationally representative data based on a longitudinal survey. Furthermore, the endogeneity of Medicaid enrollment in the prediction models could be assessed using instrumental variable techniques. The association

of Medicaid insurance with SUD service utilization appeared to be stronger for the types of services that are typically covered by health insurance, further supporting the association of Medicaid insurance with SUD service use.

Despite these strengths, several limitations of the study should be considered. First, NESARC data collection spans the period of 2001–2005. The expansion of Medicaid programs in several states continued in the ensuing years and was further reinforced by the ACA in states that chose to expand Medicaid. The profiles of substance use have also changed over time (Center for Behavioral Health Statistics and Quality, 2016). For instance, the prevalence of opioid and cannabis use has increased over time. Thus, the provided estimates of the effect of Medicaid may not necessarily apply to more recent years. Nevertheless, the prevalence of treatment seeking for SUD in the population, the contribution of Medicaid to SUD treatment, and the mix of inpatient, outpatient and residential services for treatment of SUD did not appreciably change between 2004 and 2014 (Han et al., 2015; Mark et al., 2016). Furthermore, there is no evidence that SUD services covered under Medicaid have declined since early 2000s. Thus, the effects of Medicaid enrollment in the years following the implementation of ACA are not likely to be smaller than estimated in this study. Second, the findings of the study are at variance with some studies that examined the early effect of ACA expansion of health insurance. However, the results of these studies are mixed (McKenna, 2017; Saloner, Akosa Antwi, Maclean, & Cook, 2018; Saloner, Bandara, Bachhuber, & Barry, 2017; Wen, Hockenberry, Borders, & Druss, 2017). Furthermore, most studies cover only the first 1 or 2 years of the full implementation of ACA. It may take a longer time for any changes in service use to become detectable. Many of the state expansion programs that were captured in the current study were implemented in the 1999's, thus allowing the clients and the services to adapt to changes in insurance availability (Aletraris, Edmond, & Roman, 2017). Third, many substance use treatment programs do not accept Medicaid due to regulatory policies, such as state requirements for physician involvement in service delivery (Andrews, 2014). Furthermore, in the years covered by this study, states varied considerably in the types of services offered and accessibility of those services, resulting in significant differences in patterns of SUD service use across states (Clark, Samnaliev, & McGovern, 2007). These policies could not be assessed in this analysis. Nevertheless, the use of state fixed effects adjusted for some of this unmeasured variability. Fourth, a significant proportion of substance use treatments are court-mandated. NESARC did not assess whether treatment was court-mandated or self-initiated. Court-mandated treatment may not be as responsive to availability of insurance as self-initiated treatment. Fifth, a number of states passed and implemented parity legislations over the past two decades. However, before ACA, these legislations mainly impacted privately insured individuals. ACA mandated that all state Medicaid agencies—including those that have opted out of expansion—were required to comply with parity requirements in benchmark and managed care plans. The extent of compliance with this requirement and its impact on SUD services need to be assessed in future research. Future research should also evaluate whether substance treatments received under Medicaid are effective in addressing the needs of clients with SUD.

5. CONCLUSIONS

In the context of the above limitations, the results provide useful longitudinal information on the impact of state Medicaid expansion initiatives on SUD treatment service use at a national level. Individuals with SUD have traditionally faced formidable barriers to care, including financial barriers and lack of insurance (Chen et al., 2013; Kaufmann, Chen, Crum, & Mojtabai, 2014; Mojtabai, 2005; Mojtabai et al., 2011). These data, in conjunction with data on the early impact of ACA (Saloner, Akosa Antwi, Maclean, & Cook, 2017) highlight the potential beneficial effects of Medicaid expansion on reducing these financial barriers and making services more readily accessible to this vulnerable population.

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Appendix

Table A

Medicaid enrollment and the percent uninsured among the non-elderly US adults with family income<200% of Federal Poverty Level, 2001–2002.

State	Medicaid	Uninsured
Alabama	19.1%	35.3%
Alaska	21.5%	44.8%
Arizona	17.6%	41.6%
Arkansas	13.8%	38.6%
California	18.8%	44.1%
Colorado	9.5%	43.9%
Connecticut	19.2%	32.7%
Delaware	21.9%	27.7%
District of Columbia	30.2%	33.4%
Florida	14.7%	43.2%
Georgia	12.0%	39.4%
Hawaii	17.8%	23.9%
Idaho	16.0%	41.1%
Illinois	16.9%	37.6%
Indiana	11.5%	35.2%
Iowa	16.5%	29.8%
Kansas	12.2%	36.6%
Kentucky	15.8%	33.4%
Louisiana	15.7%	44.4%
Maine	29.5%	29.7%
Maryland	12.2%	43.6%

State	Medicaid	Uninsured
Massachusetts	34.2%	25.5%
Michigan	19.9%	31.6%
Minnesota	21.5%	28.8%
Mississippi	24.4%	37.9%
Missouri	18.9%	33.8%
Montana	16.6%	33.0%
Nebraska	15.0%	29.1%
Nevada	6.2%	44.7%
New Hampshire	12.3%	34.2%
New Jersey	19.8%	40.5%
New Mexico	16.4%	46.8%
New York	25.2%	39.3%
North Carolina	16.1%	39.7%
North Dakota	16.6%	27.9%
Ohio	18.5%	34.8%
Oklahoma	13.6%	43.9%
Oregon	24.5%	33.7%
Pennsylvania	21.9%	29.2%
Rhode Island	30.2%	28.4%
South Carolina	22.8%	34.4%
South Dakota	13.7%	30.4%
Tennessee	32.3%	25.6%
Texas	10.0%	53.3%
Utah	11.6%	35.3%
Vermont	31.3%	25.5%
Virginia	12.8%	35.3%
Washington	20.6%	33.3%
West Virginia	23.3%	33.2%
Wisconsin	20.8%	27.6%
Wyoming	12.5%	42.7%

Source of data: Hoffman, C., & Wang, M. (2003). Health insurance coverage in America: 2002 data update. Retrieved from https://kaiserfamilyfoundation.files.wordpress.com/2013/01/health-insurance-coverage-in-america-2002-data-update.pdf

Table B

Association of Medicaid enrollment at T1 with substance use disorder treatment between T1 and T2 in participants of National Epidemiologic Survey on Alcohol and Related Conditions *with a lifetime SUD* who were asked about the use of SUD services at T2.

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
Medicaid	.200	.638	.755	.246	.121	.046
Medicare	.044	.106	.680	.044	.106	.680
Private insurance	−.201	.061	.002	−.201	.061	.002
CHAMPUS/VA	.163	.133	.227	.163	.133	.228
Male sex	Ref.	.	.	Ref.	.	.
Female sex	−.180	.052	.001	−.180	.052	.001
Age 18–29 yrs	Ref.	.	.	Ref.	.	.
Age 30–39 yrs	−.023	.075	.761	−.023	.075	.761
Age 40–54 yrs	.020	.069	.776	.020	.069	.776
Age 55+	−.555	.108	<.001	−.555	.108	<.001
Non-Hispanic white	Ref.	.	.	Ref.	.	.
Non-Hispanic black	−.050	.089	.575	−.050	.089	.575
Hispanic	−.038	.085	.654	−.038	.085	.654
Other	−.126	.157	.423	−.126	.157	.423
Personal income <$20K	Ref.	.	.	Ref.	.	.
Personal income $20K - <$35K	−.113	.071	.120	−.113	.071	.120
Personal income $35K - <$60K	−.290	.087	.001	−.290	.087	.001
Personal income $60K+	−.361	.101	.001	−.361	.101	.001
Any 12-month SUD	.256	.052	<.001	.256	.052	<.001
States						
Alabama	Ref.	.	.	Ref.	.	.
Alaska	−.676	.390	.088	−.677	.390	.088
Arizona	−.031	.256	.904	−.031	.256	.905
Arkansas	−.159	.464	.733	−.159	.464	.733
California	−.033	.265	.901	−.033	.265	.901
Colorado	−.030	.278	.913	−.029	.276	.918
Connecticut	−.042	.283	.881	−.042	.283	.882
Delaware	.699	.307	.026	.699	.307	.026
District of Columbia	−.217	.257	.402	−.219	.255	.392
Florida	−.185	.266	.488	−.185	.266	.489
Georgia	−.503	.308	.107	−.502	.308	.107
Hawaii	.116	.266	.665	.116	.266	.664
Idaho	−.346	.330	.299	−.345	.330	.299
Illinois	.079	.269	.770	.080	.269	.768

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
Indiana	.237	.285	.408	.238	.285	.406
Iowa	.122	.299	.685	.122	.299	.685
Kansas	−.492	.263	.066	−.492	.263	.066
Kentucky	.188	.314	.552	.188	.314	.552
Louisiana	−.535	.321	.101	−.536	.321	.101
Maine	−.754	.434	.087	−.756	.433	.086
Maryland	.004	.291	.989	.005	.291	.986
Massachusetts	−.149	.293	.612	−.152	.289	.601
Michigan	−.113	.265	.671	−.113	.265	.671
Minnesota	.048	.262	.855	.048	.262	.855
Mississippi	−.137	.335	.684	−.139	.334	.679
Missouri	−.135	.278	.628	−.136	.277	.626
Montana	−.847	.548	.127	−.846	.548	.127
Nebraska	−.155	.298	.605	−.155	.298	.604
Nevada	.032	.385	.934	.034	.385	.930
New Hampshire	−.395	.304	.198	−.395	.304	.199
New Jersey	−.268	.288	.355	−.268	.288	.355
New Mexico	.093	.286	.745	.093	.286	.746
New York	−.073	.269	.786	−.074	.268	.782
North Carolina	.102	.324	.754	.102	.324	.754
North Dakota	.098	.377	.796	.098	.377	.795
Ohio	−.165	.318	.607	−.165	.318	.607
Oklahoma	−.390	.278	.165	−.389	.278	.166
Oregon	.144	.290	.622	.143	.290	.623
Pennsylvania	−.225	.276	.419	−.225	.276	.418
Rhode Island	.137	.257	.595	.135	.254	.597
South Carolina	−.165	.338	.627	−.166	.338	.625
South Dakota	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Tennessee	−.149	.395	.708	−.152	.380	.691
Texas	−.503	.268	.065	−.502	.268	.066
Utah	.093	.284	.744	.094	.284	.741
Vermont	.160	.295	.589	.156	.288	.590
Virginia	−.072	.287	.803	−.071	.287	.805
Washington	−.101	.269	.708	−.101	.269	.707
West Virginia	−.499	.461	.283	−.500	.460	.282
Wisconsin	−.166	.306	.588	−.167	.306	.588
Wyoming	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Constant	−1.266	.271	<.001	−1.268	.269	<.001

	Bivariate probit model			Naïve probit model		
	B	SE	*p*	B	SE	*p*
Model predicting individual Medicaid enrollment						
Instrumental variables						
% of low-income covered by Medicaid	.027	.010	.009			
% of low-income covered by Medicaid among those with Medicaid or uninsured	.004	.007	.586			
Constant	−2.672					
rho	.021	.282	.941			

Validity Tests

Joint adjusted Wald test for the association of instrumental variables with the individual Medicaid enrollment status: F(2, 64)=12.29, $p<.001$

Overidentification tests:

Adjusted Wald test for the variable % of low-income covered by Medicaid: F(1, 65)=.01, $p=.939$

Adjusted Wald test for the variable % of low-income covered by Medicaid among those with Medicaid or uninsured: F(1, 65)=.96, $p=.331$

Abbreviations: T1 represents baseline interview and T2, the follow-up interview. B stands for the regression coefficient, SE, for standard error, and SSI for supplemental security income.

[a] None of the participants from this state used SUD services between T1 and T2.

Table C

Association of Medicaid enrollment at T1 with substance use disorder treatment between T1 and T2 in participants of National Epidemiologic Survey on Alcohol and Related Conditions who were asked about the use of SUD services at T2.

	Bivariate probit model			Naïve probit model		
	B	SE	*p*	B	SE	*p*
Medicaid	.308	.769	.690	.237	.103	.024
Medicare	.055	.090	.541	.055	.090	.542
Private insurance	−.185	.057	.002	−.185	.057	.002
CHAMPUS/VA	.157	.122	.204	.157	.122	.204
Male sex	Ref.	.	.	Ref.	.	.
Female sex	−.259	.047	<.001	−.259	.047	<.001
Age 18–29 yrs	Ref.	.	.	Ref.	.	.
Age 30–39 yrs	.011	.066	.866	.011	.066	.867
Age 40–54 yrs	.014	.061	.823	.014	.061	.823
Age 55+	−.494	.096	<.001	−.494	.096	<.001
Non-Hispanic white	Ref.	.	.	Ref.	.	.
Non-Hispanic black	−.076	.072	.294	−.076	.072	.294
Hispanic	−.142	.076	.067	−.142	.076	.067
Other	−.187	.129	.152	−.187	.129	.152
Personal income <$20K	Ref.	.	.	Ref.	.	.
Personal income $20K - <$35K	−.123	.064	.058	−.123	.064	.059
Personal income $35K - <$60K	−.245	.075	.002	−.245	.075	.002

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
Personal income $60K+	−.276	.087	.002	−.276	.087	.002
SUD in past year (at T1)	.660	.047	<.001	.660	.048	<.001
State						
Alabama	Ref.	.	.	Ref.	.	.
Alaska	−.523	.395	.190	−.522	.395	.191
Arizona	.012	.167	.941	.012	.167	.942
Arkansas	−.130	.435	.766	−.130	.435	.766
California	−.050	.177	.779	−.050	.177	.779
Colorado	.001	.192	.997	−.002	.190	.993
Connecticut	−.094	.205	.646	−.095	.205	.645
Delaware	.382	.207	.070	.383	.207	.069
District of Columbia	−.135	.165	.415	−.132	.160	.414
Florida	−.150	.184	.419	−.151	.184	.416
Georgia	−.499	.231	.034	−.499	.231	.034
Hawaii	.114	.176	.518	.114	.176	.519
Idaho	−.267	.255	.298	−.268	.255	.298
Illinois	.058	.177	.744	.057	.177	.746
Indiana	.199	.211	.348	.198	.211	.353
Iowa	.161	.194	.409	.161	.194	.410
Kansas	−.462	.180	.012	−.463	.180	.012
Kentucky	.180	.220	.416	.180	.220	.416
Louisiana	−.383	.255	.138	−.382	.255	.138
Maine	−.776	.369	.039	−.774	.368	.040
Maryland	.037	.193	.848	.036	.193	.853
Massachusetts	−.185	.215	.392	−.182	.207	.384
Michigan	−.063	.179	.726	−.062	.179	.728
Minnesota	.064	.170	.710	.064	.170	.710
Mississippi	−.151	.245	.540	−.149	.243	.543
Missouri	−.104	.186	.576	−.104	.185	.579
Montana	−.759	.498	.132	−.760	.499	.132
Nebraska	−.104	.215	.628	−.104	.214	.629
Nevada	.196	.250	.434	.194	.250	.441
New Hampshire	−.365	.233	.123	−.365	.233	.122
New Jersey	−.307	.200	.129	−.308	.200	.128
New Mexico	.135	.207	.517	.136	.207	.514
New York	−.087	.183	.637	−.085	.182	.641
North Carolina	.074	.249	.768	.073	.249	.769
North Dakota	.037	.340	.914	.036	.340	.915

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
Ohio	−.139	.243	.571	−.138	.243	.571
Oklahoma	−.351	.193	.074	−.351	.193	.074
Oregon	.177	.213	.409	.178	.213	.407
Pennsylvania	−.183	.193	.345	−.183	.193	.346
Rhode Island	.079	.168	.642	.082	.162	.613
South Carolina	−.198	.258	.445	−.197	.257	.447
South Dakota	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Tennessee	−.113	.332	.735	−.109	.316	.732
Texas	−.372	.179	.041	−.373	.180	.042
Utah	.172	.204	.401	.172	.204	.404
Vermont	.165	.195	.399	.171	.187	.366
Virginia	−.101	.199	.614	−.102	.199	.609
Washington	.059	.176	.737	.060	.176	.735
West Virginia	−.388	.413	.350	−.387	.412	.352
Wisconsin	−.100	.211	.637	−.099	.210	.638
Wyoming	--[a]	--[a]	--[a]	--[a]	--[a]	--[a]
Constant	−1.693			−1.691		
Model predicting individual Medicaid enrollment						
Instrumental variables						
% of low-income covered by Medicaid	.023	.009	.011			
% of low-income covered by Medicaid among those with Medicaid or uninsured	.005	.006	.423			
Constant	−2.620					
rho	−.032	.340	.925			

Validity Tests

Joint adjusted Wald test for the association of instrumental variables with the individual Medicaid enrollment status: F (2, 64)=20.45, $p<.001$

Overidentification tests:

Adjusted Wald test for the variable % of low-income covered by Medicaid: F (1, 65)=.20, $p=.660$

Adjusted Wald test for the variable % of low-income covered by Medicaid among those with Medicaid or uninsured: F (1, 65)=.67, $p=.415$

Abbreviations: T1 represents baseline interview and T2, the follow-up interview. B stands for the regression coefficient, SE, for standard error, and SSI for supplemental security income.

[a]None of the participants from this state used SUD services between T1 and T2.

Highlights

- States have traditionally varied in Medicaid eligibility and enrollment.
- Medicaid enrollment is associated with increased odds of future use of substance use services.
- The association is more pronounced for services that are typically covered by insurance.

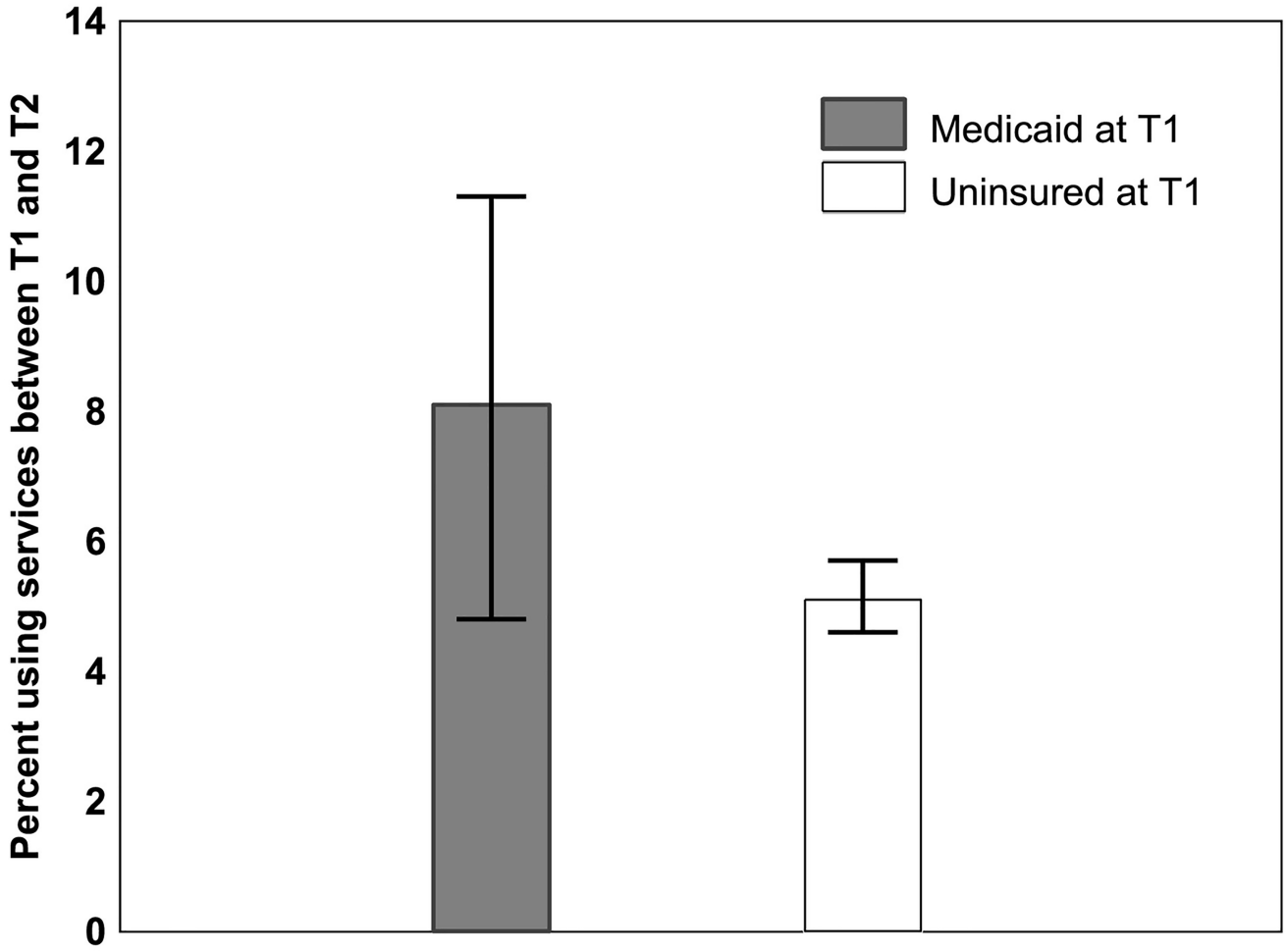

Figure 1.

Adjusted probabilities of substance use disorder treatments between T1 and T2 according to Medicaid enrollment status at T1 based on the naïve probit model presented in Table 2; the National Epidemiologic Survey on Alcohol and Related Conditions.

Table 1

Characteristics of participants in the total sample and sub-samples for the examining the association of Medicaid enrollment at T1 and use of services between T1 and T2 in the National Epidemiologic Survey on Alcohol and Related Conditions.

	Total sample (N= 34,653)		Sub-sample for assessment of substance use disorder treatments (N= 10,216)	
Variable	**N**	**Percent**	**N**	**Percent**
Sex				
Female	20,089	52.1	4,144	35.7
Male	14,564	47.9	6,072	64.3
Age, years				
18–29	6,719	21.8	2,600	28.5
30–39	7,299	20.1	2,659	24.8
40–54	10,226	29.6	3,356	31.9
55+	10,409	28.5	1,601	14.9
Race/ethnicity				
Non-Hispanic white	20,174	70.9	7,007	78.5
Non-Hispanic black	6,577	11.0	1,337	7.8
Hispanic	6,356	11.6	1,504	9.0
Other	1,546	6.5	368	4.7
Personal income in $1,000				
<20	16,385	46.2	3,787	37.4
20 - <35	8,093	22.8	2,522	23.7
35 - <60	6,519	19.1	2,393	23.0
60+	3,656	11.8	1,514	15.9
SUD in past year (at T1)	4,813	14.7	4,313	42.2
Health Insurance at T1				
Medicaid	2,610	5.7	586	4.4
Medicare	6,889	18.2	929	8.3
Private insurance	23,125	69.7	7,316	73.2
Other insurance	1,183	3.5	391	4.0
No insurance	6,248	18.0	1,912	18.7

Abbreviations: T1 represents baseline interview and T2, the follow-up interview. SUD stands for substance use disorder.

Table 2

Association of Medicaid enrollment at T1 with substance use disorder treatment between T1 and T2 in participants of National Epidemiologic Survey on Alcohol and Related Conditions.[a]

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
Health insurance (Ref: uninsured)						
Medicaid	.200	.638	.755	.246	.121	.046
Medicare	.044	.106	.680	.044	.106	.680
Private insurance	−.201	.061	.002	−.201	.061	.002
Other insurance	.163	.133	.227	.163	.133	.228
Female sex	−.180	.052	.001	−.180	.052	.001
Age, years (Ref:18–29)						
30–39	−.023	.075	.761	−.023	.075	.761
40–54	.020	.069	.776	.020	.069	.776
55+	−.555	.108	<.001	−.555	.108	<.001
Race/ethnicity (Ref.: Non-Hispanic white)						
Non-Hispanic black	−.050	.089	.575	−.050	.089	.575
Hispanic	−.038	.085	.654	−.038	.085	.654
Other	−.126	.157	.423	−.126	.157	.423
Personal income in $1,000 (Ref: <20)						
20-<35	−.113	.071	.120	−.113	.071	.120
35-<60	−.290	.087	.001	−.290	.087	.001
60+	−.361	.101	.001	−.361	.101	.001
SUD in past year (at T1)	.256	.052	<.001	.256	.052	<.001
Constant	−1.266			−1.268		
Model predicting individual Medicaid enrollment						
Instrumental variables						
% of low-income covered by Medicaid	.027	.010	.009			
% of low-income covered by Medicaid among those with Medicaid or uninsured	.004	.007	.586			
Constant	−2.672					

	Bivariate probit model			Naïve probit model		
	B	**SE**	***p***	**B**	**SE**	***p***
rho	.021	.282	.941			

Abbreviations: T1 represents baseline interview and T2, the follow-up interview. B stands for the regression coefficient, SE, for standard error, and SSI for supplemental security income.

[a]The models also adjusted for the state fixed effects. The full analyses results are presented in Appendix Table B.

Table 3

Association of Medicaid status at T1 with different types of substance use disorder treatments between the two waves in participants of the National Epidemiologic Survey on Alcohol and Related Conditions with lifetime SUD.

	Medicaid at T1		Un-insured at T1		Comparison		
Type of substance use treatment	**N**	**%**	**N**	**%**	**AOR**	**95 %CI**	***p***
Any substance use treatment	64	11.9	154	7.6	1.66	1.04,2.66	.034
Treatments potentially covered by health insurance	60	11.3	118	6.0	2.05	1.28,3.31	.004
Outpatient clinic, including outreach programs and day or partial hospital	24	4.0	37	1.4	2.24	1.05,4.79	.038
Inpatient ward of a psychiatric or general hospital	20	4.3	21	0.8	3.59	1.49,8.66	.005
Detoxification ward or clinic	26	4.9	41	2.1	2.36	1.15,4.84	.020
Rehabilitation program	29	5.4	58	3.0	2.16	1.15,4.09	.018
Private office of physician, psychiatrist, psychologist, or social worker	45	8.6	69	3.5	2.33	1.40,3.86	.001
Methadone Maintenance Program	5	0.6	5	0.4	1.45	0.36,5.83	.593
Emergency room	17	3.6	24	1.1	2.74	1.04,7.26	.042
Treatments not covered by insurance	49	8.9	123	6.2	1.62	0.96,2.73	.070
Self-help groups (e.g., AA, NA)	39	7.1	102	5.3	1.47	0.89,2.43	.135
Family services or other social services	27	4.7	37	2.0	2.85	1.34,6.07	.007
Halfway house or therapeutic community	7	1.1	14	0.6	1.55	0.47,5.17	.468
Crisis Center	7	1.2	6	0.4	2.18	0.62–7.68	.220
Employee Assistance Program (EAP)	2	0.2	5	0.3	1.08	0.19–6.07	.933
Help from clergyman, priest, rabbi, or any type of religious counselor	13	2.0	25	1.2	1.36	0.58–3.22	.477

[a]Regression model adjusted for sex, age, race/ethnicity, income, employment status, receipt of SSI, substance use disorder and mood or anxiety disorders in the past year (at T1) as well as other types of insurance enrollment.