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Health Insurance Coverage is Associated with Access to Substance Use Treatment Among Individuals with Injection Drug Use: Evidence from a 12-year Prospective Study

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Abstract

Objective.—Understand how insurance impacts access to services among people who have injected drugs.

Methods.—1,748 adults who have injected drugs were assessed at twice-annual study visits between 2006 and 2017 (18,869 visits). Use of specialty substance use treatment, receipt of buprenorphine, and having a regular source of medical care were assessed for association with concurrent insurance coverage. Random intercept logistic regression was used to adjust for potential confounders.

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Results.—When participants acquired insurance, they were more likely to report specialty substance use treatment (aOR 2.0, 95% CI 1.6 to 2.5), a buprenorphine prescription (aOR 3.3, 95% CI 2.0 to 5.5), and a regular source of medical care (aOR 6.3, 95% CI 5.1 to 7.8).

Conclusion.—Insurance is associated with increased use of three important services for individuals who inject drugs.

Implications.—Expanding insurance may facilitate access to substance use treatment and other needed health services.

Keywords

Substance use treatment; insurance; injection drug use; cohort study

1. Introduction

The United States is currently experiencing an epidemic of drug-related deaths and related health problems, driven primarily by misuse of opioids (National Institute on Drug Abuse, 2017). Expanding access to and utilization of evidence-based substance use treatment is an essential strategy for reducing opioid-related morbidity and mortality in the United States (Alexander, Frattaroli, & Gielen, 2015; Christie et al., n.d.). However, while 2.5 to 4.5 million Americans are estimated to suffer from an opioid use disorder (Kolodny et al., 2015), only about one in ten receive any form of treatment (Park-Lee, Lipari, Hedden, Kroutil, & Porter, 2018). Further, while medication treatments like buprenorphine and methadone are more effective at treating opioid use disorder than psychosocial treatments alone (Volkow, Frieden, Hyde, & Cha, 2014), most people who receive specialty treatment for an opioid use disorder do not receive medication-assisted treatment (Krawczyk, Feder, Fingerhood, & Saloner, 2017).

Financial barriers such as lack of insurance coverage are a primary obstacle to receiving treatment for opioid use disorder (Ali, Teich, & Mutter, 2016). In particular, problems related to insurance and payment have been cited by physicians as a barrier to prescribing buprenorphine (Walley et al., 2008). This is especially concerning as people with substance use disorders – particularly opioid use disorders – are more likely to be uninsured and have lower income than the general population (Feder et al., 2017).

Given the major recent and upcoming reforms to insurance provision in the United States, it is essential to better understand how insurance coverage influences access to opioid use disorder treatment and related services. Despite insurance coverage and financial factors being commonly listed as barriers to substance use treatment (Ali et al., 2016), research on the direct impact of insurance on utilization of substance use treatment to date has been equivocal. Feder and colleagues (Feder et al., 2017) found that following a major national expansion of Medicaid eligibility in 2014 under the Affordable Care Act (ACA), the uninsured rate among adults with heroin use disorder declined substantially, but there was no evidence of an overall increase in substance use treatment among those with heroin use disorder. By contrast, Saloner and colleagues found that Suboxone prescriptions increased in States that expanded Medicaid under the Affordable Care Act relative to states that did not

(Saloner, Levin, Chang, Jones, & Alexander, 2018). Wen and colleagues found that states that expanded Medicaid under Section 1115 waivers saw modest reductions in self-reported unmet need for substance use services among adults with a behavioral health conditions (Wen, Druss, & Cummings, 2015). A number of factors could explain these mixed findings, including the historically predominant role of government grants in funding substance use treatment (Barry & Huskamp, 2011); non-quantitative treatment limits like requirements for prior authorization and “fail-first” policies that dilute the power of insurance to facilitate treatment access (Christie et al., n.d.); a national shortage of substance use providers (Jones, Campopiano, Baldwin, & McCance-Katz, 2015); and the fact that States may have cut back on funding for programs for the uninsured as insurance coverage expanded.

Given the mixed research findings described above, there is a need for more nuanced research on health insurance coverage trends and the impact of different types of insurance on access to substance use treatment and related services among people with opioid use problems. The current study utilizes data from a prospective cohort study of 1,700 adults who have injected drugs and were followed for more than a decade from 2005 to 2017. This well-studied cohort of adults among whom opioid misuse is endemic offers a rare opportunity to assess how insurance coverage has impacted access to services for people with an opioid use disorder over time. Specifically, we sought to address the following questions:

1. What are the main forms of insurance coverage in a cohort of adults who have injected drugs, and how did this change over time?
2. Is acquiring any insurance coverage, or acquiring any specific type of insurance, associated with the use of three important services that were regularly assessed in this cohort: specialty substance use treatment, buprenorphine treatment, or having a regular source of medical care?
3. Did the association of insurance coverage with use of the above services change over the last decade change?

2. Materials and Methods

2.1. Study Population

Data were drawn from the AIDS Linked to the Intravenous Experience (ALIVE) study, an active, community-recruitment, prospective cohort study of adults living in and around Baltimore City, Maryland. In 1988, 2,946 participants who had injected drugs in the prior 10 years were recruited to study the natural history of HIV. Additional waves of recruitment were conducted in 1994–1994, 1998, 2000, 2005–2008, and 2015–2017 to replenish the original sample. The Johns Hopkins University institutional review board approved the study and all participants provided informed written consent. Details of ALIVE are described elsewhere (Vlahov et al., 1991).

The present analysis used data from all ALIVE participants who attended at least two study visits between 2006 and 2017, the period during which information about buprenorphine treatment was collected. Since lagged treatment use at the immediate prior visit was a

covariate in the analysis (see "Analysis"), all first study visits were dropped. Further, since other lagged covariate values were used in the analysis, study visits were also dropped if they post-dated the immediate prior visit by more than one and a half years. The sample was restricted to participants who provided data on all covariates included in the analysis (6% of study visits were excluded for missing data), for a final sample size of 1,724 participants and 18,465 study visits. Sample demographics and summary statistics are presented in Exhibit 1.

2.2. Measures

Three treatment outcomes of interest were assessed for the six-month period prior to each study period. *Receipt of specialty substance use treatment* was defined as participating in a residential overnight treatment program, a residential overnight detoxification program, or an outpatient treatment program for drugs or alcohol (not including self-help groups). *Receipt of buprenorphine* was assessed from 2006–2013 by asking if participants received a prescription for buprenorphine from somewhere other than a drug treatment program." In 2014–2017, this question was revised slightly to ask if participants 'received a prescription for buprenorphine' (see "Analysis" for how this discrepancy was addressed). *Having a usual source of medical care* was assessed by asking participants if they had "one doctor's office or clinic location where they went for most medical care."

The exposure of interest was self-reported health insurance status. We compared insured participants to uninsured participants. We also considered six types of insurance separately – Medicaid, Medicare, private insurance, Veteran Affairs (VA) coverage, Ryan White insurance, and a grouped classification for any other insurance type. This final group most likely included participants receiving insurance through a special Maryland state-operated health insurance program "Primary Adult Care" for low-income people otherwise not eligible for Medicaid that was phased out in 2014 following expansion of Medicaid under the Affordable Care Act.

Fixed characteristics assessed at baseline that we theorized based on previous literature as related to the use of treatment services and examined as potential confounders included age, sex, race, and having at least a high school education. Potential time-varying confounders assessed at each follow-up visit included past 6-month injection drug use, heroin use, crack use, unhealthy alcohol use (defined as having an Alcohol Use Disorder Identification Test (AUDIT) score greater than 7 (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993)), HIV status, (defined using a categorical variable with three levels: HIV−, HIV+ with undetectable viral load, and HIV+ with detectable viral load). HIV status was ascertained by ELISA testing followed by Western blot to confirm positivity. HIV+ participants had follow-up plasma HIV RNA levels performed by quantitative PCR (qPCR) using the COBAS AmpliPrep/COBAS Taqman HIV-1 Monitor test, version 2 (Roche Diagnostics, Indianapolis, Indiana) with <50 copies/mL considered the limit of detection.

2.3 Analysis

The analysis was completed in several steps. First, we calculated the prevalence (as a proportion of study visits) of each insurance coverage type in each study year. We also estimated the prevalence of each treatment outcome stratified by insurance status (insured

vs. uninsured) in each study year. This was to identify and describe trends in insurance coverage and treatment in the study population over the study period.

Second, we estimated the association between insurance status and each type of service using multi-level logistic regression models. We regressed the receipt of each type of service on insurance status. We adjusted models for participants' service use status at the immediate prior visit, in order to adjust for the potential role of service use initiation in leading to insurance coverage. We adjusted for the proportion of visits at which the participant was insured prior to the current visit, to isolate the effect of being insured at the current visit. We also adjusted for all potential confounding variables described above. In the case of time-varying confounders, we adjusted for both participants' status at the immediate prior study visit, as well as for the mean of participants' time-lagged confounders at all visits up to and including the immediate prior study visit, to account for factors in the immediate and more distant past that may impact both insurance coverage and treatment use. Further, we adjusted for calendar time in years with a linear time trend. We included a dummy variable to indicate year 2014 or later to account for the more inclusive measure of buprenorphine use introduced in the survey in 2014. Finally, we included random intercept terms, so that a separate model intercept was estimated for each participant to account for clustering of outcomes caused by repeated measures for the same participant. The association of each treatment outcome with insurance type was estimated similarly, using dummy variables to denote each insurance type.

Third, because both exploratory data visualizations and prior literature suggested the association of insurance with treatment might have changed over the study period (Feder et al., 2017), we assessed whether the association of insurance with treatment varied over time by adding an interaction term between calendar year and the insurance status. A statistically significant interaction offers evidence that the association of insurance with treatment changed over time. Linear combinations of regression coefficients were used to compute the estimated association of insurance coverage with treatment in each calendar year, and these annual estimates of association were plotted for ease of interpretation.

All regression coefficients were exponentiated and can be interpreted as odds ratios – the ratio of the odds of receiving treatment associated with having insurance coverage relative to being uninsured. Wald 95% confidence intervals are presented, and associations are treated as statistically significant at the $p<0.05$ level. All analyses were conducted in R. The "lme4" package was used for estimating random intercept models (Bates, Machler, Bolker, & Walker, 2015). In the sensitivity analysis, the "survival" package was used to estimate conditional logistic regression models (Therneau & Lumley, 2017). Four sensitivity analyses are described in Appendix A. Detailed regression models are shown in Appendix B.

3. Results

The sample was comprised of 1,724 participants with 18,465 study visits. Averaging over all visits (Exhibit 1), participants had a mean age of 51. Two-thirds of visits were by males, and 90% were African American. Heroin use and injection drug use each had a past-six-month

prevalence of 29 percent, crack use 25 percent, and alcohol problems 19 percent. Participants were HIV positive at about 30 percent of visits.

Over all visits, an average of 87% of the sample was insured, but over the study period the prevalence of insured among participants increased dramatically from 65% in 2006 to 98% in 2017 (Exhibit 2). The largest increase in insurance occurred between 2006 and 2011 and was mainly due to growing enrollment in “other” insurance types (As noted, this was likely the Maryland “Primary Adult Care” (PAC) program for low-income people otherwise not eligible for Medicaid). A second increase occurred following the 2014 expansion of Medicaid under the Affordable Care Act to low-income adults; during that same period, “other” insured types were also almost completely replaced by Medicaid. Veterans and Ryan White coverage both had prevalences under 5% and were essentially stable over time.

Specialty substance use treatment in the past six months was reported at 36% of study visits, receiving buprenorphine was reported at 6% of visits, and having a regular source of medical care was reported at 87% of visits. Having any health insurance was strongly associated with using specialty substance use treatment (aOR 2.0, 95% CI 1.6 to 2.5), receiving a buprenorphine prescription (aOR 3.3, 95% CI 2.0 to 5.5), and having a regular source of medical care (aOR 6.3, 95% CI 5.1 to 7.8). This was true after conditioning on participants’ estimated underlying predisposition to use treatment (the model-estimated “random intercept”), as well as on past use of treatment, and all fixed and time-varying confounding variables. This association was observed across each of the insurance types examined, with one exception: having private insurance was not significantly associated with increased use of specialty treatment, although it was associated with receipt of buprenorphine and having a regular source of medical care. The strength of associations differed by types of coverage: Medicaid and Medicare had consistently stronger associations with treatment than private insurance (all adjusted odds ratios are shown in Exhibit 3).

The positive association of insurance with treatment use increased over the course of the study, an effect that was statistically significant for specialty treatment use ($z = 2.7$, $p < .01$) and having a regular source of medical care ($z = 3.8$, $p<.001$), but not buprenorphine use ($z = 0.56$, $p > 0.1$) (see Exhibit 4 for estimated odds ratio in each study year). All sensitivity analyses (see Appendix A) produced qualitatively similar results (data not shown).

4. Discussion

Our findings show that the proportion of persons uninsured in this cohort of persons who have injected drugs declined dramatically over the past decade. This decline was likely driven by two policy changes over this time period. The first was likely Maryland’s PAC. Initiated in 2006, this was a State of Maryland financed and operated health insurance program for low-income childless adults who were not eligible for Medicaid or Medicare (Maragh-Bass, Powell, Park, Flynn, & German, 2017). The second factor that likely contributed to the increasing trend in insurance coverage was Maryland’s expansion of Medicaid to low-income childless adults under the Affordable Care Act in 2014 – this brought the already low uninsured rate in this cohort to near zero, and also replaced the PAC program. Consequently, the proportion of the ALIVE cohort covered by Medicaid increased

from about two-fifths of the cohort in 2013 to three-fifths by 2017. While Maryland's health insurance landscape is unique, these findings show the central role that Medicaid plays in providing insurance coverage to adults who inject drugs.

We found that having insurance was associated with three-times higher odds of receiving buprenorphine treatment relative to being uninsured. This suggests that insurance coverage helps enable access to this essential opioid use disorder treatment medication. Expanding use of medication-assisted treatment is a major policy goal (Saloner & Barry, 2018) but, as noted, prior studies have offered contradictory evidence on the effects of insurance coverage on substance use treatment use (Feder et al., 2017; Saloner, Bandara, Bachhuber, & Barry, 2017; Saloner et al., 2018; Wen et al., 2015). This study differs from those others in a number of ways. Other studies rely on comparison across different years of cross-sectional surveys or administrative data; this study follows the same individuals over multiple observations. Further, this study does not examine the impact of insurance gains specifically tied to major policy change. As Feder and colleagues discuss (Feder et al., 2017), major policy changes could have broader unintended consequences on the treatment landscape. For example, states might respond to a Medicaid expansion by reducing direct grant funding for substance use treatment programs; this could cause the few remaining uninsured to face even greater barriers to care. By contrast, our study examines fluctuations in insurance coverage within individuals followed over an extended period that are not necessarily linked to any policy change. Thus, the associations of insurance with treatment seen here may reflect the impact of gaining insurance for an individual, rather than the net population impact of large increases in coverage caused by policy change.

Finally, it is noteworthy that, even by 2017, when nearly all of the cohort was insured, only about one-seventh of the cohort reported receiving buprenorphine in the past six months. Thus, our findings are consistent with other research that additional barriers to medication treatment – including not perceiving a need for treatment, a shortage of providers who are licensed to prescribe buprenorphine (Christie et al., n.d.; Jones et al., 2015), the stigma associated with medication-assisted treatment (Krawczyk, Negron, Nieto, Agus, & Fingerhood, 2018; Olsen & Sharfstein, 2014), lack of transportation (Ali et al., 2016), and others – must still be addressed to facilitate broader access to care.

We also found that having insurance was associated with two-times the odds of reporting participation in a specialty substance use treatment program. Compared to buprenorphine, by 2017, participants were much more likely to receive specialty substance use treatment in the past six months, and this was reported by nearly half the cohort. We could not assess whether methadone was used in these treatment settings, because in 2014 ALIVE substantially modified the question used to inquire about methadone. However, during the period from 2014 to 2017, past six-month methadone use was reported at between 29 percent and 39 percent of study visits. Thus, while nationally most specialty treatment for opioid use disorder does not include methadone or buprenorphine (Krawczyk et al., 2017), we are cautiously optimistic that many of these specialty treatment visits included methadone treatment.

We found that having insurance was associated with dramatically higher odds of reporting a regular source of medical care. This is consistent with research from randomized experiments that show that acquiring health insurance is associated with increased primary care utilization (Baicker et al., 2013). In addition to prescribing buprenorphine, general physicians can help treat commonly co-occurring medical and mental health disorders, (Grant et al., 2004; Rosen, Smith, & Reynolds, 2008) and can also function as a point where substance use disorders can be identified and a referral made to specialty care (Christie et al., n.d.).

For the most part, all forms of insurance appear to have increased the odds associated with accessing treatment. The exception was that private commercial health insurance was not associated with an increase in the odds of specialty substance use treatment. Previous research has noted that despite federal parity laws for mental health and substance use treatment, private insurance plans often impose cost sharing, and regularly establish non-quantitative limits like “fail first” policies and requirements for prior authorization (Legal Action Center, 2015). This suggests a need to address potential barriers to treatment and assure parity regulations are being met for persons with substance use disorders who are privately insured. It is also worth noting that having Medicaid was more strongly associated having a regular source of medical care than private insurance. While it is encouraging that Medicaid is so strongly associated with having a regular source of medical care, it is important to note that Medicaid programs and benefits differ substantially across states.

Finally, we found that the gap in treatment utilization between insured and uninsured visits increased over the course of the past decade. It is possible that, as the population of insured persons has grown, states have cut back on funding for programs for the uninsured. This may also partially explain why treatment utilization has not yet increased overall nationally following the expansion of Medicaid under the Affordable Care Act.

4.1 Limitations

This study has several limitations that should be noted.

1. Treatment for opioid use disorder is often indefinite and may extend many years after the end of drug use, making it difficult to identify the target population of people who need treatment. For this reason, we chose to include the entire sample of ALIVE participants, even if they did not report any heroin or other opioid use during the study period, on the assumption that, since all have injected drugs and nearly all have used opioids (70% of the sample reported heroin use at least once just during the study period), all could potentially benefit from treatment. However, it is possible that some cohort members may have used in the remote past, and would not necessarily require any treatment. We also conducted a sensitivity analysis restricted to only adults who reported using heroin or another opioid during the study period (Appendix A), and our findings were not changed.
2. We were not able to assess methadone use consistently during most of the study period and cannot specify how frequently it was used in specialty treatment. Relatedly, the assessment of buprenorphine changed over the course of the study

period. Consequently, it is difficult to fully assess the true proportion of participants receiving medication treatment.

3. We could not assess access to other forms of beneficial behavioral health treatment (e.g., mental health counseling, naltrexone treatment), though insurance coverage may have impacted use of these treatments.

4. As with all observational studies, our study may be limited by unmeasured confounding. A particularly important instance of this limitation is comparison of effects across insurance types, because different insurance programs confer eligibility on a different basis (e.g. VA insurance is only for veterans, Medicare is only for the elderly or qualified disabled). Another possible instance of unmeasured confounding comes from time-varying characteristics we could not control for, for example unmeasured behavioral health conditions or income changes that affect both eligibility for some insurance programs and use of treatment.

5. It is also important to comment on the limited generalizability of this study sample. Our study employs a sample that is predominantly African American, male, older middle-aged who have injected drugs, live in or near one urban center with a major medical center, and live in a state with relatively expansive public insurance eligibility. Participants have chosen to take part in a medical research study, often for years – this group may therefore be more likely to seek treatment and have insurance than the population of injection drug users who do not volunteer for research. Findings may also not be readily generalizable to other communities affected by the opioid epidemic, which include a range of geographic and sociodemographic groups with diverse drug use behaviors who may demonstrate different insurance and treatment utilization trends. Rural communities, in particular, may have fewer or even no substance use treatment providers available (Ellis, Konrad, Thomas, & Morrissey, 2009; Stein et al., 2015). Consequently, insurance may have a different impact on use of substance use treatment in other states and populations. Factors that facilitate access to substance use treatment in rural settings need to be assessed in future research.

5. Conclusion

Our study offers powerful new evidence about insurance coverage and its impact on substance treatment and related care in a population where injecting drugs and opioid use are common, and has a number of policy implications:

First, expanding Medicaid can likely substantially impact access to healthcare in populations where drug use is common. States that have not yet expanded Medicaid to low-income childless adults are likely impeding residents' access to needed opioid use disorder care. Relatedly, it is concerning that many states are considering imposing work requirements for program participation as an incentive to increase workforce participation (Hinton, 2018). People with substance use disorders are more likely to be out of the workforce than the general population (Henkel, 2011). Since our research suggests that acquiring Medicaid

coverage plays an important role in facilitating treatment access, these policies may be self-defeating if they impede access to treatment for people with substance use disorders who need to enter the workforce.

Second, substantial barriers to treatment – in particular, medication-assisted treatment, considered to be the highest standard of care – remain even after those with substance use disorder acquire insurance. Some residual financial barriers to medication-assisted treatment could be addressed through more aggressive enforcement of the Mental Health Parity and Addiction against non-quantitative treatment limits (Christie et al., n.d.). Addressing othersbarriers, including low perceived need for treatment, stigma against treatment and against medication use, and a shortage of buprenorphine prescribers and methadone programs, remain important active areas of research.

Nevertheless, our findings provide evidence that public health insurance plans like Medicaid play an integral role in responding to the opioid epidemic.

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Appendix A:: Sensitivity Analyses

Four sensitivity analyses were conducted, to ensure the robustness of our findings:

1. We repeated the analysis for the receipt of buprenorphine excluding years 2014 and later, to account for the change in the language of the ALIVE buprenorphine question.
2. While all ALIVE participants have injected drugs at some point in their life, only approximately 80% of the study sample actually reported injecting drugs or using heroin during the time period under examination. Participants may still seek treatment for other substances, or for opioid use not queried in the survey (e.g., prescription pain-reliever misuse), but for assurance we repeated the analysis in the more restricted population of individuals who actually reported heroin or other injection drug use in at least one visit during the study period.
3. We repeated the analysis using conditional logistic regression models instead of random-intercept models. These models are an alternative approach to clustered data and help ensure the robustness of our findings to our choice of modeling procedure. Here, we clustered observations within individuals, and regressed each outcome on all time-varying covariates (covariates that are fixed within a cluster are not meaningful in conditional logistic regression).
4. Multi-level models were estimated using Expectation Maximization (EM) algorithms, which iteratively converge to an estimated optimal set of fixed and random effects. The main analysis used the Nelder-Mead optimizer.[20] This produced occasional convergence warnings, so as a sensitivity analysis we re-

estimated all models using the BOBQYA optimizer, [17] to check that different optimizers produced similar parameter estimates and model log likelihoods.

Appendix B:: Model Specification

Let i index the time participant and t index the visit. Let $\boldsymbol{B_i}$ be the matrix of all baseline covariates, $\boldsymbol{X}_{it}$ be the matrix of all time varying covariates at time t and $\overline{\boldsymbol{X}}_{it}$ be the matrix of the cumulative mean of all time varying covariates up to time t. Let β_p be individual regression coefficients and, for conciseness, $\boldsymbol{\beta}$ be vectors of regression coefficients. The effect of insurance on treatment was estimated using the following random intercept logistic regression.

$$
\begin{aligned}
&treatment_{it} \sim Bernoulli\left(\mu_{it}\right)\\
&logit\left(\mu_{ij}\right) = \beta_{0i} + \beta_1\, insurance_{it} + \beta_2 treatment_{i(t-1)} + \beta_3 age_{it} + \beta_4\, year_{it} + \beta_5 I(year > 2013)_{it}\\
&+ \boldsymbol{\beta}^{\dagger}\boldsymbol{B}_i + \boldsymbol{\beta}^{\dagger\dagger}\boldsymbol{X}_{i(t-1)} + \boldsymbol{\beta}^{\dagger\dagger\dagger}\overline{\boldsymbol{X}}_{i(t-1)}\\
&\beta_{0\mathrm{i}} \sim Gaussian\left(\beta_0, \tau^2\right)
\end{aligned}
$$

The effects of particular types of insurance were estimated with dummy variables corresponding to each insurance type in place of the single insurance variable. To test for a changing effect of insurance over time, an extra term for the product of insurance and year was added.

References

Alexander GC, Frattaroli S, & Gielen AC (2015). The Prescription Opioid Epidemic: An Evidence-Based Approach. Johns Hopkins Bloomberg School of Public Health,© 2015.

Ali MM, Teich JL, & Mutter R (2016). Reasons for Not Seeking Substance Use Disorder Treatment: Variations by Health Insurance Coverage. The Journal of Behavioral Health Services & Research, 1–12. [PubMed: 26621038]

Baicker K, Taubman SL, Allen HL, Bernstein M, Gruber JH, Newhouse JP, … Finkelstein AN (2013). The Oregon Experiment — Effects of Medicaid on Clinical Outcomes. New England Journal of Medicine, 368(18), 1713–1722. 10.1056/NEJMsa1212321 [PubMed: 23635051]

Barry CL, & Huskamp HA (2011). Moving beyond parity—mental health and addiction care under the ACA. New England Journal of Medicine, 365(11), 973–975. [PubMed: 21848453]

Bates D, Machler M, Bolker B, & Walker S (2015). Fitting Linear Mixed-Effects Models Using lme4. Journal of Statistical Software, 67 10.18637/jss.v067.i01

Christie GC, Baker CGC, Cooper GR, Kennedy CPJ, Madras B, & Bondi FAGP (n.d.). THE PRESIDENT'S COMMISSION ON COMBATING DRUG ADDICTION AND THE OPIOID CRISIS.

Ellis AR, Konrad TR, Thomas KC, & Morrissey JP (2009). County-Level Estimates of Mental Health Professional Supply in the United States. Psychiatric Services, 60(10), 1315–1322. 10.1176/ps.2009.60.10.1315 [PubMed: 19797370]

Feder KA, Mojtabai R, Krawczyk N, Young AS, Kealhofer M, Tormohlen KN, & Crum RM (2017). Trends in insurance coverage and treatment among persons with opioid use disorders following the Affordable Care Act. Drug and Alcohol Dependence, 179, 271–274. [PubMed: 28823834]

Grant BF, Stinson FS, Dawson DA, Chou SP, Dufour MC, Compton W, … Kaplan K (2004). Prevalence and Co-occurrence of Substance Use Disorders and IndependentMood and Anxiety

Disorders: Results From the National Epidemiologic Survey on Alcohol and RelatedConditions. Archives of General Psychiatry, 61(8), 807 10.1001/archpsyc.61.8.807 [PubMed: 15289279]

Henkel D (2011). Unemployment and substance use: a review of the literature (1990–2010). Current Drug Abuse Reviews, 4(1), 4–27. [PubMed: 21466502]

Hinton E (2018, 1 17). Approved Changes to Medicaid in Kentucky. Retrieved February 21, 2018, from https://www.kff.org/medicaid/issue-brief/approved-changes-to-medicaid-in-kentucky/

Jones CM, Campopiano M, Baldwin G, & McCance-Katz E (2015, 7 9). National and State Treatment Need and Capacity for Opioid Agonist Medication-Assisted Treatment [research-article]. 10.2105/AJPH.2015.302664

Kolodny A, Courtwright DT, Hwang CS, Kreiner P, Eadie JL, Clark TW, & Alexander GC (2015). The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. Annual Review of Public Health, 36, 559–574.

Krawczyk N, Feder KA, Fingerhood MI, & Saloner B (2017). Racial and ethnic differences in opioid agonist treatment for opioid use disorder in a U.S. national sample. Drug and Alcohol Dependence, 178, 512–518. 10.1016/j.drugalcdep.2017.06.009 [PubMed: 28719885]

Krawczyk N, Negron T, Nieto M, Agus D, & Fingerhood MI (2018). Overcoming medication stigma in peer recovery: a new paradigm. Substance Abuse, 1–6.

Legal Action Center. (2015). Confronting an Epidemic: The Case for Eliminating Barriers to Medication-Assisted Treatment of Heroin and Opioid Addiction.

Maragh-Bass AC, Powell C, Park J, Flynn C, & German D (2017). Sociodemographic and access-related correlates of health-care utilization among African American injection drug users: The BESURE study. Journal of Ethnicity in Substance Abuse, 16(3), 344–362. 10.1080/15332640.2016.1196629 [PubMed: 27404977]

National Institute on Drug Abuse. (2017, 9 15). Overdose Death Rates. Retrieved February 19, 2018, from https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates

Olsen Y, & Sharfstein JM (2014). Confronting the Stigma of Opioid Use Disorder—and Its Treatment. JAMA, 311(14), 1393 10.1001/jama.2014.2147 [PubMed: 24577059]

Park-Lee E, Lipari RN, Hedden SL, Kroutil LA, & Porter JD (2018). Receipt of Services for Substance Use and Mental Health Issues among Adults: Results from the 2016 National Survey on Drug Use and Health. Retrieved January 26, 2018, from https://www.samhsa.gov/data/sites/default/files/NSDUH-DR-FFR2-2016/NSDUH-DR-FFR2-2016.htm

Rosen D, Smith ML, & Reynolds CF (2008). The Prevalence of Mental and Physical Health Disorders Among Older Methadone Patients. The American Journal of Geriatric Psychiatry, 16(6), 488–497. 10.1097/JGP.0b013e31816ff35a [PubMed: 18515693]

Saloner B, Bandara S, Bachhuber M, & Barry CL (2017). Insurance Coverage and Treatment Use Under the Affordable Care Act Among Adults With Mental and Substance Use Disorders. Psychiatric Services. 10.1176/appi.ps.201600182

Saloner B, & Barry CL (2018). Ending the Opioid Epidemic Requires a Historic Investment in Medication-Assisted Treatment. Journal of Policy Analysis and Management, 37(2), 431–438. 10.1002/pam.22047

Saloner B, Levin J, Chang H-Y, Jones C, & Alexander GC (2018). Changes in Buprenorphine-Naloxone and Opioid Pain Reliever Prescriptions After the Affordable Care Act Medicaid Expansion. JAMA Network Open, 1(4), e181588–e181588. 10.1001/jamanetworkopen.2018.1588 [PubMed: 30646116]

Saunders JB, Aasland OG, Babor TF, De La Fuente JR, & Grant M (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption-II. Addiction, 88(6), 791–804. 10.1111/j.1360-0443.1993.tb02093.x [PubMed: 8329970]

Stein BD, Gordon AJ, Dick AW, Burns RM, Pacula RL, Farmer CM, … Sorbero M (2015). Supply of buprenorphine waivered physicians: The influence of state policies. Journal of Substance Abuse Treatment, 48(1), 104–111. 10.1016/j.jsat.2014.07.010 [PubMed: 25218919]

Therneau TM, & Lumley T (2017). Package 'survival.' R Package Version, 241–3.

Vlahov D, Anthony JC, Munoz A, Margolick J, Nelson KE, Celentano DD, … Polk BF (1991). The ALIVE study, a longitudinal study of HIV-1 infection in intravenous drug users: description of methods and characteristics of participants. NIDA Research Monograph, (109), 75–100.

Volkow ND, Frieden TR, Hyde PS, & Cha SS (2014). Medication-Assisted Therapies — Tackling the Opioid-Overdose Epidemic. New England Journal of Medicine, 370(22), 2063–2066. 10.1056/NEJMp1402780 [PubMed: 24758595]

Walley AY, Alperen JK, Cheng DM, Botticelli M, Castro-Donlan C, Samet JH, & Alford DP (2008). Office-Based Management of Opioid Dependence with Buprenorphine: Clinical Practices and Barriers. Journal of General Internal Medicine, 23(9), 1393–1398. 10.1007/s11606-008-0686-x [PubMed: 18592319]

Wen H, Druss BG, & Cummings JR (2015). Effect of Medicaid Expansions on Health Insurance Coverage and Access to Care among Low-Income Adults with Behavioral Health Conditions. Health Services Research, 50(6), 1787–1809. [PubMed: 26551430]

Highlights

- People who inject drugs are more likely to receive treatment after acquiring insurance
- People who inject drugs have more stable medical care after acquiring insurance
- Public programs like Medicaid increase treatment use more than commercial insurance
- The substance use treatment gap between insured and uninsured has grown over time

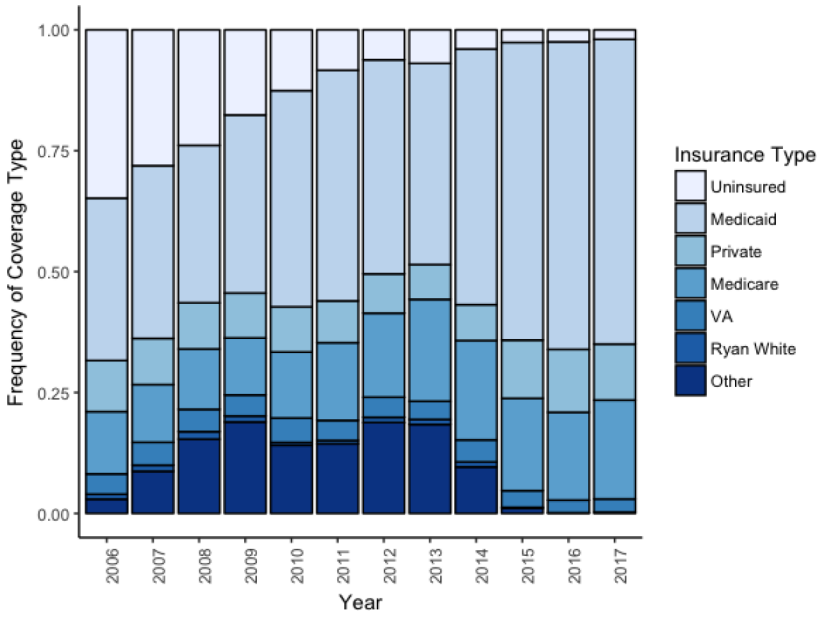

Figure 1.

Insurance Status by Coverage Type in Cohort of Baltimore Residents who have Injected Drugs, 2006–2017

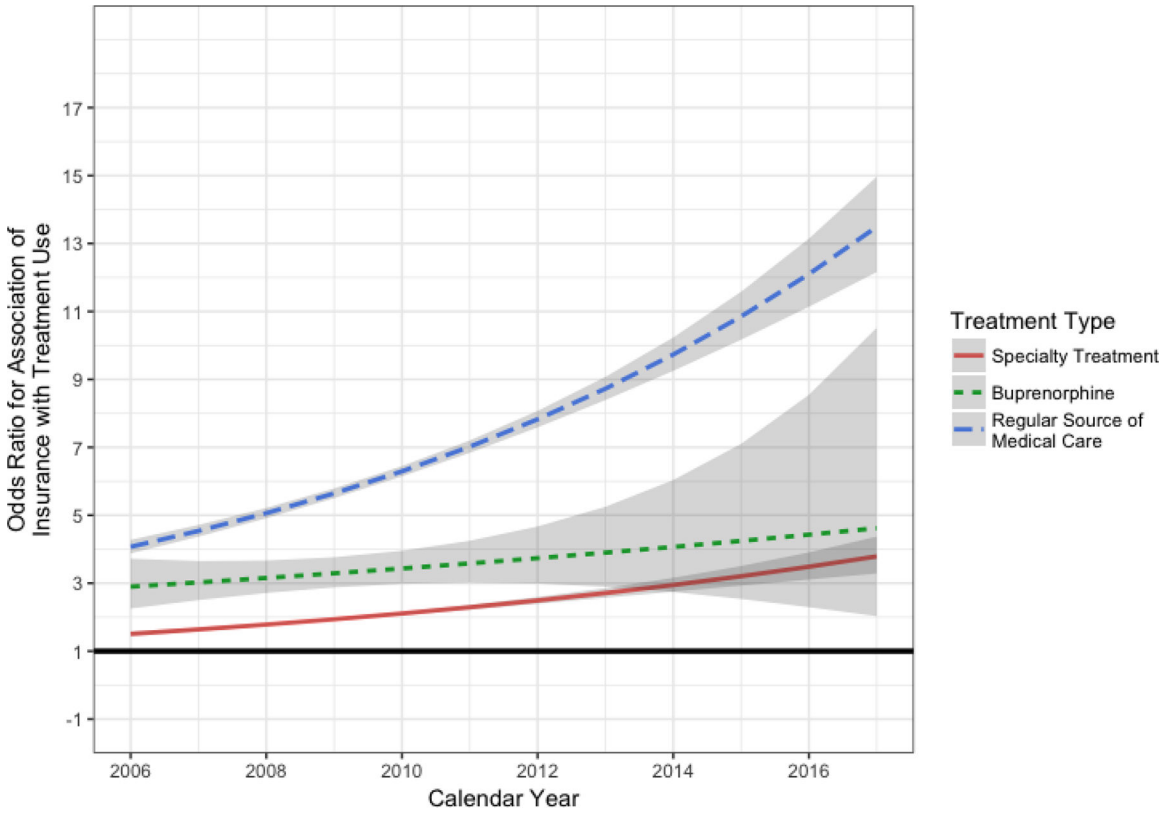

Figure 2: Positive Association of Insurance Coverage with Treatment Use Increased Over Time

Note: Increase in effect of insurance on treatment statistically is significant for specialty treatment and medical care, but not buprenorphine.

Table 1.

Summary of ALIVE Participant Study Visits, by Insurance Status, 2006–2017

	All	Uninsured	Insured
Population	18465	2409	16056
Treatment			
Specialty Treatment	36.0%	25.2%	37.6%
Buprenorphine Prescription	5.8%	1.3%	6.4%
Regular Source Medical Care	86.6%	49.1%	92.2%
Demographics			
Age (mean)	51.8	48.2	52.4
Black	90.3%	88.3%	90.6%
Female	34.1%	31.1%	34.6%
At Least High School Education	42.3%	39.1%	42.8%
Drug Use			
Inject 6m	30.4%	46.2%	28.0%
Heroin 6m	28.9%	48.1%	26.0%
Alcohol Problem 6m	19.3%	23.6%	18.6%
Crack 6m	24.5%	29.9%	23.6%
HIV Status			
HIV−	70.0%	88.8%	67.2%
HTV+ Undetectable	15.6%	2.4%	17.6%
HTV+ Detectable	14.3%	8.8%	15.2%

Table 2.

Adjusted Relative Odds of Treatment (95% Confidence Interval)

	Specialty Treatment	Buprenorphine	Medical Care
Uninsured (ref)	1.00	1.00	1.00
Any Insurance	2.03 (1.63 – 2.53)	3.31 (1.99 – 5.51)	6.28 (5.05 – 7.82)
Medicaid	2.17 (1.71 – 2.74)	2.50 (1.47 – 4.22)	6.61 (5.14 – 8.50)
Private	0.93 (0.66 – 1.31)	2.60 (1.32 – 5.13)	3.17 (2.26 – 4.44)
Medicare	1.76 (1.30 – 2.38)	3.26 (1.76 – 6.05)	8.31 (5.69 – 12.15)
Veterans	1.35 (0.79 – 2.32)	1.74 (0.58 – 5.25)	12.25 (5.36 – 28.02)
Ryan White	3.48 (1.8 – 6.73)	3.04 (0.89 – 10.33)	16.46 (3.54 – 76.58)
Other	2.06 (1.6 – 2.64)	4.28 (2.48 – 7.39)	6.78 (5.09 – 9.03)

Note: Models adjusted for past treatment; age, sex, race, and education; injection drug, heroin, crack, and problem alcohol use, and HIV status, and conditional on random intercept.

Note: 95% confidence intervals that do not contain 1 are “statistically significant” ($p < .05$)