



Published in final edited form as:

J Subst Abuse Treat. 2019 November ; 106: 107–112. doi:10.1016/j.jsat.2019.09.001.

Engagement in treatment for depression among people who inject drugs in Baltimore, Maryland

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Abstract

Introduction: Mental health care may mitigate negative consequences related to substance use and bolster engagement in care for drug dependence. Despite the increased risk of depression among people who inject drugs (PWID), the longitudinal relationship of depression symptoms with depression and drug treatment utilization in this population remains uncharacterized.

Methods: Data on depressive symptoms and depression treatment from current and former PWID in the ALIVE (AIDS Linked to the IntraVenous Experience) community-based cohort who had 3 study visits from July 2005-June 2016 were included. We used logistic regression analysis with generalized estimating equations to examine factors associated with depression treatment in the 12 months following reported major depressive symptoms (CES-D ≥ 23) in the absence of treatment. We further examined the association between depression, depression treatment, and subsequent engagement in drug treatment among those with active substance use or alcohol dependence.

Results: Of the 1544 participants, 34% were female, the median age was 51 years, and 91% were African-American. PWID reported major depressive symptoms at 22% of study visits. In adjusted analysis, acute emergency care, suicidal ideation, and recent alcohol or drug treatment were positively associated with initiating depression treatment. Depression was positively associated with subsequent treatment for substance dependence among those actively using (aOR = 1.29, 95% CI: 1.13-1.46).

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Declarations of interest: None.

Conclusions: PWID experience a high burden of depressive symptoms with significant unmet need of treatment for depression. Our findings suggest that mental health providers should bolster connections to chronic disease and alcohol and drug treatment providers.

Keywords

people who inject drugs; depression; depression treatment; observational cohort studies; substance dependence treatment

1. Introduction

The current burden of mental illness and substance use disorders among adults in the United States is staggering (Ahrnsbrak et al., 2017), and there is a well-recognized unmet need for treatment (P. S. Wang et al., 2005). Mental health issues and substance use disorders are strongly intertwined. People who inject drugs (PWID) experience a disproportionate burden of psychiatric illness, with depression being among the most common diagnoses (Dinwiddie, 2017; Kessler et al., 1997). Prevalence estimates of depression in community PWID samples vary widely, but range as high as 58% (Brienza et al., 2000; Mackesy-Amiti, Donenberg, & Ouellet, 2012; Pabayo, Alcantara, Kawachi, Wood, & Kerr, 2013). Further, PWID often experience co-occurring psychiatric conditions (Davis, Uezato, Newell, & Frazier, 2008); a study of psychiatric disorders in a population enrolled in methadone maintenance therapy found that almost half of the sample fulfilled diagnostic criteria for both an affective disorder and an anxiety disorder (Callaly, Trauer, Munro, & Whelan, 2001).

Given the overlap between depression and substance use disorder, there is cause for concern regarding access to mental health care among vulnerable PWID populations (Ahern, Stuber, & Galea, 2007; L. Wang et al., 2016). Stigmatization, social marginalization and financial insecurity may pose barriers to linkage and retention in medical care (Galea & Vlahov, 2002), along with under-reimbursement for psychiatric and substance use disorder services. Alternatively, the presence of common comorbid conditions, and therefore regular healthcare contact, may increase the likelihood of a depression diagnosis and engagement in psychiatric treatment. Mackesy-Amiti et al. reported that 52% of young PWID between the ages of 18-25 years of age with primary major depression reported psychiatric treatment in the past year. By comparison, results from the National Comorbidity Survey Replication (NCS-R) indicated 52% of 12-month cases of major depressive disorder in the general population received treatment, suggesting that PWID may experience access to treatment comparable to the general population (Kessler et al., 2003). However, longitudinal data on use of mental health care are lacking, particularly as PWID age and experience an increased burden of related chronic conditions and suffer negative consequences associated with prolonged chronic drug use and/or frequent cycling in and out of drug use for many decades (Genberg et al., 2011).

Depression may also complicate treatment of substance use disorders for PWID populations. Depression is associated with poorer substance use treatment outcomes (Compton, Cottler, Jacobs, Ben-Abdallah, & Spitznagel, 2003; McLellan, Luborsky, Woody, O'Brien, & Druley, 1983). However, the relationship between depression and treatment for substance

use disorder is complex, with some studies indicating that depression may lead to increased treatment seeking for substance use disorder among PWID (Rounsaville & Kleber, 1985; Teesson et al., 2005). Rates of depression reported from treatment cohorts tend to be higher than those reported in community-based cohorts (Teesson et al., 2005) and a meta-analysis of clinical and community-based PWID samples found a weak correlation between depression and substance use treatment participation (Conner, Pinquart, & Duberstein, 2008). Understanding how depression may affect treatment seeking for substance use disorders is an obvious first step to strengthening treatment programs and outreach.

Using a well-characterized community based cohort of PWID, we aimed with the present study to: 1) examine longitudinal factors associated with treatment for depression; and 2) examine the longitudinal relationship between depressive symptoms, depression treatment, and engagement in treatment for substance use disorder. For the second objective, due to lack of proven effective treatment options for cocaine dependence (Penberthy, Ait-Daoud, Vaughan, & Fanning, 2010) and the demonstrated effectiveness of medication assisted therapies for opioid dependence (Fullerton et al., 2014), we restricted our analysis of treatment for substance use disorder to individuals with active opioid use. Finding opportunities to reduce the burden of depression in the PWID population and highlighting barriers to substance use disorder treatment are critical to addressing these pressing public health concerns.

2. Material and Methods

2.1. Study population and study design

The AIDS Linked to the IntraVenous Experience (ALIVE) study is a community-based prospective cohort study of current and former people who inject drugs, located in Baltimore, Maryland, USA (Vlahov, Anthony, Munoz, & Margolick, 1991). After the initial recruitment of 2,946 study participants through community outreach in 1988-1989, subsequent recruitment periods occurred in the years 1994-1995, 1998, 2000, 2005-2008, and 2015-2018. Participants were eligible for recruitment if they were 18 years of age or older, reported any injection drug use within the past year, and had not had an AIDS diagnosis at study baseline. At each semi-annual study visit, participants complete interviewer-administered demographic and behavioral assessments, with additional questions assessed using self-administered audio-computer-assisted survey instruments (Macalino, Celentano, Latkin, Strathdee, & Vlahov, 2002). In the present study, we included data on self-reported depressive symptoms and depression treatment from participants who were in active follow-up between July 2005 and June 2016 when data were collected on multiple mental health conditions. We restricted to participants with data on depressive symptoms and depression treatment data from at least three consecutive study visits over the follow-up period to understand longitudinal patterns. The study has ongoing approval from the Johns Hopkins University Institution Review Board (IRB), and all study participants provided a written informed consent.

2.2. Definition of depressive symptoms and treatment for depression

The presence of depressive symptoms was assessed using the Center for Epidemiologic Studies – Depression (CES-D). The CES-D is not a clinical diagnosis of depression, but it has been validated for use in general and clinical populations (Radloff, 1977) as indicative of clinically significant symptoms consistent with depression. Items from the CES-D, which assess the experience of symptoms in the prior 7 days, were summed and we defined major depressive symptoms as a score of 23 or higher, as has been used in prior studies among similar populations (Perdue, Hagan, Thiede, & Valleroy, 2003). Treatment for depression was defined as a positive response to the following question: “Have you received treatment for depression in the last six months?”

2.3. Definition of active opioid use and treatment seeking

For the purposes of this analysis, active opioid use was defined as any report of any opioid use either by injection or non-injection routes (snorting, smoking or injecting heroin, or use of any prescription opioids not prescribed by a physician that were administered via any route). Treatment seeking for substance use disorder was defined among those reporting active opioid use as any reported participation in a drug or alcohol treatment program, including residential drug treatment or medication-assisted therapy.

2.4. Covariate definitions

Covariates of interest included time-fixed (i.e., age (in 5 year increments), sex, race/ethnicity (African-American vs. other)) and recent (prior six months) demographic characteristics (i.e., homelessness, income, disability, health insurance status), recent health care utilization and access (i.e., regular primary care provider, inpatient, outpatient and emergency room visits, alcohol or drug treatment), recent substance use (i.e., cigarette frequency, frequency of alcohol, any injection drug use, frequency of injection (heroin, cocaine, speedball, painkillers or other drugs), non-injection heroin or cocaine, crack, and marijuana use), recent non-fatal overdose, occurrence of and/or treatment for co-morbidities (i.e., occurrence of moderate/severe body pain, HIV infection and viral suppression, or received treatment for diabetes, high blood pressure, or high cholesterol), and mental health treatment (i.e., suicidal ideation, hospitalization for mental health reasons, recent diagnosis or treatment of anxiety or schizophrenia). Suicidal ideation was measured using the following questions: “During the last six months, have you had thoughts of taking your own life, even if you would not actually do it?” and “During the last six months, did you make a specific plan about how you would take your own life?”

2.5. Statistical analysis

First, we examined the burden of depressive symptoms and the prevalence of depression treatment in the cohort. We compared socio-demographic and clinical characteristics across strata of depression and treatment, accounting for repeated measures of the outcome per participant using multinomial logistic regression models with generalized estimating equations (GEE).

We defined the index visit as the initial study visit where depressive symptoms and depression treatment were assessed and looked prospectively only at visits wherein a

participant met our definition for major depressive symptoms, but were treatment naïve for depression. Using this definition, we regressed treatment of depression in the subsequent 12 months on characteristics at the index visit using logistic regression models with GEE to understand predictors of future depression treatment. We restricted analysis to follow-up visits without substantial gaps (≥ 10 months between study visits). As depression is often an episodic illness, participants in our study could contribute multiple follow-up periods to the analysis. To address secular changes in access to and utilization of treatment for depression during the study period, we included calendar year in the model.

In a similar analysis, we restricted the sample to those who reported active opioid use, but were naïve from substance use disorder treatment at the index visit and looked prospectively at engagement in substance use disorder treatment in the subsequent 12 months, with depressive symptoms and depression treatment at the index visit as the primary exposures of interest. We also examined the association between prospective treatment for depression and concurrent reported treatment for substance use disorder. We used logistic regression models with GEE to understand how depression and depression treatment predicted future treatment for substance use disorder.

All analyses were performed using SAS (Version 9.4; SAS Institute, Cary, NC, USA) and STATA (Version 13; STATA Corporation, College Station, TX, USA).

3. Results

3.1. Sample Characteristics

A total of 1,544 PWID from ALIVE met the inclusion criteria for this analysis. Table 1 displays the socio-demographic, drug use, and comorbidity data from the 17,986 visit included in the descriptive analysis. Overall the median age in the sample was 52 years (interquartile range (IQR): 46-56), 34% were female, and 91% were African-American. Overall 30% were actively injecting (past 6 months), while 50% reported any recent alcohol use, and 36% reported recent alcohol or drug treatment.

The prevalence of major depressive symptoms was 22% and the prevalence of depression treatment was 29%, suggesting that a portion experienced control of their depressive symptoms with treatment. At an additional 16% of visits overall, PWID reported low or moderate depressive symptoms (CES-D ≤ 23). Recent (past 6 months) treatment for anxiety was reported among 14%, with 17% reporting ever being hospitalized for a mental health problem.

3.2. Prospective Engagement in Treatment for Depression

Among the depression treatment naïve who were experiencing major depressive symptoms at the index visit (N=1793), 29% reported depression treatment in the following 12 months. Table 2 shows the associations of socio-demographic factors, health care access and utilization, substance use, and chronic condition factors with subsequent treatment for depression. Homelessness (adjusted odds ratio (aOR) = 1.34, 95% CI: 1.04-1.72), health insurance (aOR = 1.50, 95% CI: 1.15-1.96), having a recent outpatient (aOR = 1.22, 95% CI: 1.00-1.49) or emergency room visit (OR = 1.27, 95% CI: 1.04-1.56), and any alcohol or

drug treatment (aOR = 1.34, 95% CI: 1.08-1.65) were positively associated with reporting treatment for depression in the following year in analysis adjusted for age, sex, race and calendar year. Importantly, having suicidal thoughts without (aOR = 1.91, 95% CI: 1.38-2.64) or with a plan (aOR = 2.99, 95% CI: 1.90-4.72) were predictive of treatment for depression within the next year in this analysis, indicating severity played a role in motivating depression treatment. Neither metrics of regular health care engagement nor the presence of other comorbidities predicted depression treatment.

3.3. Engagement in Drug Treatment

Among the substance use treatment naive who reported active opioid use at the index visit (N=2930), 36% reported treatment for drug dependence in the following 12 months. Table 2 presents associations of initial depression status and depression treatment status with subsequent substance use disorder treatment engagement. Major depressive symptoms (aOR = 1.30, 95% CI: 1.10-1.53) were positively associated with drug treatment in the next 12 months. While the association between treatment for depression and drug treatment in the next 12 months was positive, but not statistically significant (aOR=1.11 (95% CI: 0.91-1.34), there was a positive association between prospective treatment and concurrent drug treatment (aOR = 2.07, 95% CI: 1.73-2.48).

Among other socio-demographic and clinical characteristics, homelessness (aOR = 1.39, 95% CI: 1.14-1.69), having an emergency room visit (aOR = 1.26, 95% CI: 1.07-1.49), recent (past six months) injection drug use (aOR = 1.65, 95% CI: 1.36-2.01), recent overdose (aOR=1.70, 95% CI: 1.35-2.32), and having suicidal thoughts with a plan for suicide (aOR = 1.66, 95% CI: 1.10-2.51) were all positively associated with accessing drug treatment. Interestingly, marijuana use was negatively associated with accessing drug treatment (aOR = 0.82, 95% CI: 0.69-0.98).

4. Discussion

In this study we found a high burden of depression among current and former PWID. While we used a threshold of 23 to define major symptomology consistent with prior work in PWID samples, using a standard threshold for clinically relevant symptoms (CES-D 16), nearly 40% of this population would be considered in need of treatment for depression. The high burden of depression among PWID is cause for concern. The consequences of mental illness are stark – in the general population, mental illness confers increased risk for suicide and comorbidity. For PWID, depression may have additional implications. PWID who report depressive symptoms are significantly more likely to overdose (Pabayo et al., 2013; Tobin & Latkin, 2003). Depression among PWID has also been widely demonstrated to be associated with risk factors for HIV and hepatitis C virus acquisition, such as increased injection frequency and sharing of injection equipment (Camacho, Brown, & Simpson, 1996; Latkin & Mandell, 1993; Lemstra, Rogers, Thompson, Moraros, & Buckingham, 2011; Perdue et al., 2003; Stein, Solomon, Herman, Anderson, & Miller, 2003).

We also found a high burden of unmet need for treatment of depression, with 50% of those reporting major depressive symptoms at the index visit not concurrently reporting any treatment of depression. Mental health and addiction are currently among the most pressing

public health issues in the US (Murray et al., 2013; Seth, Scholl, Rudd, & Bacon, 2018) and this snap shot of a PWID sample highlights how intertwined these issues are, and the need for interventions that address both mental health and addiction. Unfortunately, we found that indicators of more severe health or mental health states -- recent emergency room visits and suicidal thoughts and/or plans -- increased the odds of reporting treatment for depression. This may suggest that we are not effectively capturing those with a need for treatment in early or milder stages of depression or those without the most severe symptoms; rather individuals appear more likely to engage in mental health services when a health crisis occurs or when severe symptoms are manifested.

Elucidating modifiable factors associated with seeking treatment for depression may be an important component to reducing the public health burden due to mental health conditions. We found that factors related to vulnerability (recent homelessness and low income) were predictive of depression treatment. More vulnerable PWID may get enhanced access to social services. Accessing such services may be one mechanism whereby individuals obtain health insurance, another factor that was predictive of treatment in our study, as well as mental health treatment as a result. Also those reporting a recent outpatient visit were more likely to have accessed treatment for depression suggesting that simply linking with a source of care does increase access to mental health services for PWID. One potential implication of these findings is that providers treating other health conditions in an outpatient setting may consider strengthening ties to mental health treatment for aging patients reporting substance use.

In contrast, the existence of other chronic conditions did not appear to link PWID to mental health care. The comorbidity burden is high in PWID (Degenhardt et al., 2016; Dinwiddie, 2017; Klein, 2011), which can contribute to depression risk, however those reporting care for diabetes, hypertension, or high cholesterol were not more likely than those not reporting this type of care to have accessed treatment for depression. An HIV diagnosis was similarly not predictive of depression treatment, though depression is common among people living with HIV and may complicate adherence to HIV treatment and care (Sin & DiMatteo, 2014; Treisman & Angelino, 2007). Integrated mental health and HIV care may provide an opportunity to increase treatment for depression among people living with HIV who are not engaged in mental health care with the added benefit of potentially improving HIV-related outcomes (Kaaya et al., 2013). In our study, however, there was no evidence of a relationship between retention in HIV care or viral suppression and engagement in treatment for depression.

A second important question of interest was the relationship between depression and substance use disorder treatment seeking. Our results indicated that current major depressive symptoms increased the odds of subsequently reporting any type of drug treatment. The relationship between depression and drug treatment is not fully clear and may be dependent on the severity of depression, the type of substance being used, and the type of depression and drug treatment (Brorson, Ajo Arnevik, Rand-Hendriksen, & Duckert, 2013; Curran, Kirchner, Worley, Rookey, & Booth, 2002; Levin et al., 2004; Ross, Cutler, & Sklar, 1997). The mechanism for this relationship could be encouragement by mental health professionals to seek drug treatment to improve the success of depression treatment. Or those treated

successfully for depression may seek drug treatment as they recover from depression. There may also be characteristics of individuals that make them more likely to seek treatment and care in general. Treatment of depression may restore the energy, or optimism, or the ability to engage in an emotional relationship with a care provider, or re-establishment of other relationships, any and all of which may increase treatment acceptance for substance use disorder.

Strengthening the link between depression treatment and drug treatment is extremely important in this population; depression may increase drug treatment seeking, but it has also been associated with a lower chance of successful drug addiction recovery (Curran et al., 2002; Landheim, Bakken, & Vaglum, 2006). Surprisingly, despite the high prevalence of mental health issues among participants in drug treatment programs, mental health services are generally deemed inadequate at drug treatment centers (Grella & Hser, 1997). Given co-occurrence patterns of substance use disorder and depression (Compton et al., 2003), efforts to coordinate service delivery across the two care systems could provide obvious benefits to participants and potentially reduce a growing burden of both conditions. The findings from this study may help drug treatment and other care providers better identify those at risk for depression and inform strategies to simultaneously manage drug dependence, comorbidity and depression. Such integrated care for mental health, other chronic conditions and substance use could potentially improve both mental health and drug treatment outcomes (Fridell & Hesse, 2006).

This study has several limitations. Depressive symptoms were assessed using the CES-D, which screens for depressive symptoms, rather than establishing a clinical diagnosis of depression. Both depression treatment, drug use, and substance use disorder treatment were collected by self-report and may be subject to reporting bias. Further, our data could not distinguish between types of treatment for depression or substance use disorder, including medication-based therapies or other treatment models. There may be differential effects due to specific treatment modalities that we were unable to detect in this analysis, and stronger findings with respect to medication-based therapies. To maximize the use of our rich, longitudinal data, we included multiple visit sets from individual participants, which could lead to a higher representation of individuals who have longer follow-up. However, we examined our results when selecting one unique visit set per participant and saw no differences in the main findings. Finally, although our cohort is community-based, the study sample was predominantly male, African-American and urban current and former PWID and the results presented here may not be generalizable to other samples of people who use drugs in the US or elsewhere.

4.1. Conclusions

Our study highlights the high burden of major depressive symptoms among current and former PWID and the unmet need for treatment. Prospective engagement in treatment for depression was related to factors that suggest acute mental health or medical need, pointing to a failure to adequately address depression and associated factors via regular health care. Among PWID who were actively using opioids, both depressive symptoms and depression treatment were associated with increased engagement in treatment for substance use

disorder. Whether this was due to referral to drug treatment following engagement in care for depression or to individuals experiencing depressive symptoms being motivated to seek drug treatment is a question for further research. Regardless, the evidence of overlap in engagement in care for mental health and substance use disorder suggests that we can leverage services for each issue to close the gap on both mental health and drug treatment needs among PWID. Many PWID are missing the opportunity to engage in mental health care to despite engagement in health care services for other issues and there is a lost opportunity to improve health outcomes and quality of life for former and current PWID.

Acknowledgments

We acknowledge the ALIVE study staff for collecting data and are grateful to the ALIVE study participants for their time. This work was supported by the National Institute on Drug Abuse (U01DA036297; R01DA012568). This research has also been facilitated by the infrastructure and resources provided by the Johns Hopkins University Center for AIDS Research, an NIH funded program (P30AI094189), which is supported by the following NIH Co-Funding and Participating Institutes and Centers: NIAID, NCI, NICHD, NHLBI, NIDA, NIMH, NIA, FIC, NIGMS, NIDDK, and OAR.

Role of funding source: The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. The funding sources had no role in the study design, data collection, data analysis or interpretation of the data, writing of the manuscript nor decision to submit the article for publication.

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Highlights

- People who inject drugs in this urban setting in the USA were found to experience a high burden of depressive symptoms and report a significant unmet need of treatment for depression.
- The relationship between depression and treatment for drug dependence was examined; any alcohol or drug treatment was positively associated with initiating depression treatment, and depression was positively associated with subsequent treatment for substance dependence among those actively using opioids.
- Additional efforts may be needed to strengthen connections between mental health providers and alcohol and drug treatment and services.

Frequency of socio-demographic characteristics, recent health care access and utilization, substance use, chronic and mental health conditions, stratified by depression and reported treatment at index visit among 1,544 former and current people who inject drugs contributing 17,986 visits from the ALIVE study in Baltimore, Maryland, 2005-16

Table 1.

	Not Depressed	Depressed Treated	Depressed Not treated
N (individuals)	933	441	170
Median age (IQR), in years ¹	48 (43-53)	47 (40-52)	47 (39-51)
Female	251 (27)	204 (46)	63 (37)
African-American	854 (92)	341 (77)	134 (79)
N (visits) ²	17986	5208	1987
Homeless	830 (8)	867 (17)	404 (20)
Low Income (<\$k/year)	7291 (69)	3905 (76)	1531 (80)
Disability	4529 (42)	3111 (60)	879 (44)
Health Insurance	8649 (80)	4816 (93)	1538 (77)
Usual source of primary care	8851 (82)	4870 (94)	1557 (78)
See same doctor (90% of the time)	7837 (73)	4525 (87)	1344 (68)
Inpatient visit	953 (9)	958 (19)	291 (15)
Outpatient visit	6487 (60)	4298 (83)	1154 (58)
Emergency room visit	2151 (20)	1783 (34)	594 (30)
Cigarette smoking	8326 (77)	4290 (82)	1646 (83)
Frequency of cigarette use			
None	2454 (23)	914 (18)	340 (17)
< 1 pack/day	6141 (57)	314 (61)	1027 (52)
>=1 pack/day	2109 (20)	1109 (21)	592 (30)
Any alcohol use	5294 (49)	2396 (46)	1214 (61)
Frequency of alcohol use			
None	5496 (51)	2812 (54)	773 (39)
< Daily	4723 (44)	2149 (41)	1015 (13)
Daily	571 (5)	247 (5)	199 (10)

	Not Depressed	Depressed Treated	Depressed Not treated
Any injection drug use	2907 (27)	1660 (32)	903 (45)
Frequency of injection			
None	7880 (73)	3544 (68)	1082 (55)
<Daily	1585 (15)	1006 (19)	428 (22)
Daily	1322 (12)	654 (13)	475 (24)
Non-injection heroin or cocaine	3175 (29)	2268 (44)	1101 (55)
Crack use	2014 (19)	1668 (30)	763 (38)
Marijuana use	1715 (16)	964 (19)	462 (23)
Any injection/non-injection use	4362 (40)	2700 (52)	1290 (65)
Any alcohol or drug treatment	3056 (28)	2592 (50)	782 (39)
Non-fatal overdose ³			
No drug use	7648 (71)	3363 (65)	1013 (51)
Drug use/no overdose	2889 (27)	1576 (30)	802 (41)
Drug use/overdose	230 (2)	243 (5)	163 (8)
Moderate/severe body pain	2702 (25)	2514 (48)	1038 (52)
HIV-negative	7779 (72)	3308 (64)	1429 (72)
HIV-positive/undetectable VL	1567 (15)	1038 (20)	224 (11)
HIV-positive/detectable VL	1390 (13)	830 (16)	321 (16)
Diabetes treatment	994 (9)	769 (15)	192 (10)
Hypertension treatment	4124 (38)	2288 (44)	662 (34)
High cholesterol treatment	984 (9)	576 (11)	114 (6)
Suicidal risk			
None	10580 (98)	4306 (83)	1715 (87)
Thoughts/no plan	138 (1)	548 (11)	178 (9)
Thoughts/plan	59 (1)	326 (6)	85 (4)
Anxiety treatment	162 (2)	2370 (46)	62 (3)
Schizophrenia treatment	21 (<1)	536 (10)	19 (1)
Ever hospitalized for mental health	672 (6)	2138 (41)	327 (16)

Data reflect n (%) unless otherwise indicated

³From the index visit

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² All characteristics from the prior 6 months

³ Overdose assessed only among those reporting injection drug use prior to 2014

Table 2.

Adjusted odds ratios (95% confidence intervals) of the association between recent (prior 6 months) socio-demographic characteristics, health care access and utilization, substance use, and chronic condition factors, and subsequent depression treatment from n=590 depressed/not treated; and subsequent drug treatment from n=774 with active opioid use/no drug treatment

	Depression Treatment Adjusted ¹ OR (95% CI) N(individuals)=590 N(visits)=1793	Drug Treatment Adjusted ¹ OR (95% CI) N(individuals)=774 N(visits) = 2930
Socio-demographic characteristics (prior 6 months)		
Homeless	1.34 (1.04-1.72)	1.39 (1.14-1.69)
Low income (<5K)	1.28 (0.99-1.66)	1.19 (0.99-1.31)
Disability	1.12 (0.97-1.01)	0.92 (0.77-1.11)
Health insurance	1.50 (1.15-1.96)	0.89 (0.74-1.07)
Health care access and utilization (prior 6 months)		
Usual source of primary care	1.15 (0.89-1.49)	0.93 (0.77-1.12)
See same doctor (90% of the time)	1.22 (0.98-1.53)	0.82 (0.70-0.98)
Inpatient visit	1.12 (0.86-1.44)	1.24 (0.99-1.55)
Outpatient visit	1.22 (1.00-1.49)	0.88 (0.76-1.03)
Emergency room visit	1.27 (1.04-1.56)	1.26 (1.07-1.49)
Substance use (prior 6 months)		
Cigarette use	0.86 (0.97-1.17)	0.98 (0.74-1.31)
Alcohol use	1.07 (0.85-1.34)	0.89 (0.74-1.07)
Current injection use	1.01 (0.81-1.26)	1.65 (1.36-2.01)
Non-injection heroin or cocaine	1.17 (0.94-1.45)	0.87 (0.72-1.06)
Crack use	1.24 (0.99-1.55)	1.01 (0.86-1.20)
Marijuana use	0.98 (0.76-1.26)	0.82 (0.69-0.98)
Any alcohol/drug treatment	1.34 (1.08-1.65)	---
Non-fatal overdose ²		
No drug use	1.00	1.00
Drug use/no overdose	1.03 (0.83-1.29)	1.60 (1.30-1.96)
Drug use/overdose	0.92 (0.63-1.34)	1.70 (1.35-2.32)
Chronic conditions and mental health conditions (prior 6 months)		
Depression (index visit) ³	---	1.30 (1.10-1.53)
Depression treatment (index visit)	---	1.11 (0.91-1.34)
Depression treatment (prospective) ⁴		2.07 (1.73-2.48)
Moderate/severe body pain	1.11 (0.92-1.35)	0.88 (0.74-1.04)
HIV-negative	1.00	1.00
HIV-positive/undetectable	1.24 (0.85-1.82)	0.93 (0.66-1.32)

	Depression Treatment Adjusted ¹ OR (95% CI) N(individuals)=590 N(visits)=1793	Drug Treatment Adjusted ¹ OR (95% CI) N(individuals)=774 N(visits) = 2930
HIV-positive/detectable	1.22 (0.86-1.72)	1.16 (0.87-1.54)
Diabetes treatment	1.42 (0.95-2.12)	1.18 (0.82-1.71)
Hypertension treatment	1.05 (0.82-1.33)	0.94 (0.78-1.15)
High cholesterol treatment	0.93 (0.60-1.45)	0.69 (0.46-1.04)
Suicidal risk		
None	1.00	1.00
Thoughts/no plan	1.91 (1.38-2.64)	1.18 (0.87-1.60)
Thoughts/plan	2.99 (1.90-4.72)	1.66 (1.10-2.51)

¹ models adjusted for calendar year, age, sex, and race

² Overdose assessed only among those reporting injection drug use prior to 2014

³ depression defined as CESD ≥ 23 or depression treatment

⁴ prospective treatment in 12 months following index visit

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