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Military Veterans' Overdose Risk Behavior: Demographic and Biopsychosocial Influences

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Abstract

Background: U.S. military veterans face many biopsychosocial (BPS) challenges post-service that may elevate risk for opioid-related overdose including physical pain, mental health concerns and social stressors. Some veterans use opioids to manage pain and cope with social readjustment. This study assessed associations between BPS factors and recent engagement in overdose risk behavior in a community sample of post-9/11 veterans who used opioids in New York City.

Methods: Participants (n=218) were recruited through convenience sampling and completed a baseline assessment including a validated Opioid Risk Behavior Scale (ORBS) that measured past-30-day engagement in 22 opioid-related overdose risk behaviors. Analyses examined associations between ORBS scores and hypothesized demographic, biological/physical, psychological and social predictors. Incident rate ratios estimated the expected relative difference in ORBS score associated with each predictor.

Results: Participants reported an average of 4.72 overdose risk behaviors in the past 30 days. Significant independent predictors of higher ORBS score, after adjustment for demographics and current prescription medications, were past-30-day: depression symptoms; unsheltered or living in

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ASB, LE designed the study; ASB, JAW, LE, BWS, HG contributed to the manuscript design and writing of drafts; JAW conducted statistical analyses; ASB, JAW, LE, BWS, HG all contributed to the development of subsequent manuscript drafts and interpretation of findings. All authors approved the manuscript.

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a homeless shelter (vs. private housing); history of mental health treatment; experiencing stressful life events; average pain severity; and pain interference.

Conclusion: Veterans face myriad BPS challenges and, while drug-related overdose risks are well understood, findings suggest that other factors—including mental health, pain and stressful life events—may also be associated with overdose risk among opioid-using veterans. The larger challenges veterans face should be considered in the context of BPS forms of pain management when tailoring and delivering overdose prevention interventions.

Keywords

overdose; US military veterans; opioids; opioid misuse; biopsychosocial framework

1. Introduction

The nation remains in a public health crisis involving opioid-related morbidity and mortality; overdose (OD) rates among the general population have continued to climb in recent years and remain at epidemic proportions across the country [1]. In 2017, across the United States, approximately 70,237 drug OD fatalities were reported, 67.8% of which involved an opioid [2, 3]. With their high rates of opioid analgesic use to treat acute and chronic pain, U.S. military veterans represent a population at elevated risk for fatal and non-fatal OD [4–9]. Research indicates that veterans die from opioid-related OD at roughly twice the rate of the general population [10, 11]. To help stem the OD public health crisis among veterans and other populations, it is critical to capture the interplay of biological, psychological, and social precipitants of OD risk. This study draws upon a biopsychosocial (BPS) perspective [12, 13] to examine associations of biological/physiological, psychological, and social events that may impact substance use behaviors known to present risk for opioid-related OD.

1.1. Veterans' Biological/Physiological Risk Factors for Overdose.

Veterans' use of opioids is often iatrogenically initiated in response to service-related injury and subsequent acute and chronic pain [14, 15]. Many receiving opioids to manage chronic pain underestimate their risk of opioid OD, although their risk profile is similar to veterans diagnosed with opioid use disorder (OUD) [16]. For veterans serving post-9/11, high rates of opioid and concurrent opioid-benzodiazepine prescribing, often at Department of Veterans Affairs (VA) hospitals, has resulted in high rates of opioid dependence and opioid-related OD. These prescribing practices have since drawn criticism, [17, 18] and prescription opioids (POs) are now less widely prescribed [19, 20]. However, evidence suggests that some veterans who had been prescribed POs have transitioned to obtaining POs from illicit sources [21] or to heroin use which presents additional OD risks, especially if the heroin contains fentanyl [22, 23].

1.2. Veterans' Psychological Risk Factors for Overdose.

Veterans also exhibit high rates of mental health disorders (e.g. depression, anxiety, post-traumatic stress disorder [PTSD]) [8, 24–27] and may use substances as a means of coping with emotional pain and trauma. Among veterans experiencing homelessness, substance use

and comorbid mental health concerns are endemic, with 46% of veterans who have been homeless for more than 2 years diagnosed with co-occurring mental illness and substance use disorder (SUD) [37]. Certain mental health challenges that are commonly reported by veterans, such as anxiety and difficulties relating to civilians [28], may predispose them to heightened risk of OD, especially if they impel solitary opioid use [29]. The concurrent use of opioids with anti-anxiety medications, particularly benzodiazepines, is a known OD risk factor [30], and veterans who are co-prescribed benzodiazepines with POs have significantly increased OD risk compared to veterans with no benzodiazepine prescription history [17]. Compounding these vulnerabilities, research suggests that veterans may avoid treatment for sub stance-related and mental health problems due to treatment stigma [31–33] or concerns about a mental health diagnosis limiting future employment opportunities [33].

1.3. Veterans' Social Risk Factors for Overdose.

Numerous social factors – such as difficulties managing relationships and finding stable housing and employment, and interactions with the legal system – can function as risk factors for OD in some opioid-using populations. Research has found that some veterans feel socially disconnected and alienated from more affluent, non-veteran populations [7, 8, 34], and struggle with obtaining and maintaining employment [35]. Additionally, the settings in which many unstably housed veterans reside (such as shelters, single room occupancies or transitional housing) are often characterized by widespread drug distribution and consumption. Incarceration experience is common among unstably housed veterans [36, 37] and may heighten veterans' OD risk, particularly for those with mental illness and/or substance use issues [38, 39].

To explore how this complex of BPS challenges may relate to opioid-related OD risk, this study aimed to identify salient BPS correlates of OD-related risk behavior among a community sample of post-9/11 U.S. military veterans recruited in New York City. The study's distinctive focus on the understudied population of veterans in an urban, community-based setting contributes to the larger literature on veterans' OD risk behavior.

2. Methods

2.1. Participants and Procedures

Cross-sectional data were collected between August 2014 and June 2016 from 225 U.S. military veterans who served during the Iraq and Afghanistan conflict era, post 9/11 [46, 47].

Study participants were post-9/11 military veterans who reported any licit or illicit opioid use (e.g., POs, heroin, methadone, buprenorphine) within the 30 days prior to enrollment. Participants were recruited throughout NYC using venue-based (e.g. homeless shelters, veteran-specific residences) and chain-referral sampling methods. In keeping with the exploratory nature of this study, this past-30-day opioid use eligibility criterion was selected to allow us to include veterans with a broad range of opioid use patterns, including medical and nonmedical users, as well as occasional and frequent users. Past-30-day use is also a standard window for assessing recent drug use, thereby facilitating comparison with other

studies of opioid use and OD risk. Veteran status was established via DD-214 and/or VA or veterans' housing identification. For those lacking these forms of identification, staff (three of whom were themselves post-9/11 veterans) queried them about their Military Occupational Specialty (MOS), boot camp location, and service/deployment experiences.

After providing written informed consent, participants completed a roughly 2-hour baseline assessment of their military service history, alcohol, PO and other drug use, current pain, and housing, relationship and mental health status, including significant life events experienced in the past 30 days. Assessments were administered face-to-face, with a trained interviewer entering data on a tablet computer. Participants received \$60 at the completion of the assessment. All procedures were approved by the Institutional Review Board of National Development and Research Institutes, Inc. (NDRI).

2.2. Measures

2.2.1. Overdose Risk Behaviors—Participants completed a validated 22-item Overdose Risk Behavior Scale (ORBS), reporting the number of days in the past 30 they engaged in a series of opioid OD-related risk behaviors. The 22-item scale was developed by our team and includes 5 subscales: (a) adherence to prescribed opioid dosage and therapeutic purpose; (b) alternative routes of PO administration (e.g., crushing and sniffing or injecting pills); (c) solitary opioid use; (d) use of non-prescribed OD-associated drugs (e.g., benzodiazepines); and (e) concurrent use of POs with other psychoactive drugs and/or alcohol. All 22 ORBS behaviors are listed in Table 2. The ORBS scale has demonstrated good reliability (α =.88) and validity through a moderately strong correlation with the Reported Overdose Experiences Scale (RODES; r=.46, *p*<0.001). In our prior work, higher ORBS score was associated with a higher number of self-reported OD experiences [40]. For this analysis, ORBS scores were calculated by re-coding the original response to each item (reported as 0-30 days) into one of three categories (0 days = 0 [no risk]; 1-14 days = 1 [low risk]; 15-30 days = 2 [high risk]) and then calculating the sum of all 22 items (possible score range: 0-44).

2.2.2. Sociodemographic and Medication Status Covariates—In selecting control variables, we first controlled for standard demographic characteristics, as is a common practice in epidemiological analyses (e.g., [41]). To further adjust for confounders that may obscure the influence of BPS factors, per the goal of the analysis, three variables indicating whether or not participants had a recent prescription for POs and/or other sedating medications, or were currently in methadone maintenance treatment (MMT) for OUD, were included as control variables in the final analytic model, given their potential to directly impact participants' OD risk, either as risk [42, 43] or protective factors (as with individuals stabilized on MMT [44]). Although housing status could be considered a social factor, we included it as a control variable because individuals who are homeless or unstably housed, as were a significant proportion of participants in this study, have been shown to have elevated risk for opioid OD relative to those with stable housing [45]. The reference category for all sociodemographic and medication status covariates was the group that represented the largest proportion of the sample (unless otherwise noted), and all continuous predictors are grand mean-centered. All variables are self-reported.

Age.: Participants' ages were re-coded into three categories for analysis: 21-34; 35-44; and 45-60.

<u>Gender.</u>: Participants were asked to indicate whether they were male, female, or transgender. Since no participants reported being transgender, the sample is assumed to consist of cisgender men and women.

<u>Race/Ethnicity.</u>: Participants were asked to indicate their race and ethnicity according to U.S. Census categories. For analysis, responses were grouped into three categories: Black, non-Hispanic; White, non-Hispanic; and Hispanic or Latino.

Housing type.: Participants' current housing was re-coded into five categories: (1) private house or apartment; (2) public housing; (3) transitional housing or SRO; (4) homeless shelter; and (5) no housing/living on the street.

Recent Prescription for Depressant Medication.: Participants were asked if, at any time in the past 30 days, they "had a valid doctor's prescription for pain, anxiety, depression, epilepsy, Parkinsonism, psychosis, or to help you sleep?" This question was intended to include a variety of classes of medication (e.g., opioid analgesics, anxiolytics such as benzodiazepines, other sedatives/hypnotics, antidepressants, etc.) that may cause or contribute to OD by depressing respiration. Responses were coded dichotomous ly (yes/no).

Recent Prescription for Opioid Medication for Pain.: Responses to the question, "At any time in the past 30 days, did you have a valid doctor's prescription for opioid pain medicine (for example, OxyContin, Percocet, Opana)?" were also coded in binary fashion (yes/no).

Current Participation in Methadone Maintenance Treatment was assessed with the query, "Are you participating in a methadone maintenance program for opioid addiction?" and responses were binary (yes/no).

2.2.3. Biopsychosocial Predictor Variables—The 15 hypothesized BPS predictor variables used in this analysis were selected based on a thorough review of the literature on OD risk (e.g.[39, 41, 45–50]) as well as our team's formative qualitative research with opioid-using veterans in the target population [8] and consultation with experts in the field (e.g., [51–53]). Hypothesized predictors of veterans' OD risk behavior include biological (e.g., pain [54]), psychological (e.g., depression symptoms [55, 56]) and social (e.g., stressful life events [39, 57]) factors that have been found to be associated with OD in prior research. Our selection of BPS predictors also prioritized variables that were assessed in the past 30 days to correspond with the ORBS' past-30-day reporting period.

2.2.3.1. Treatment History

History of Mental Health Treatment.: Participants responded 'yes' or 'no' to the question, "Have you ever had treatment for any mental health problem other than alcohol or drugs?" Responses were categorized as: never; previously/not currently; and currently.

History of Drug Treatment.: Participants indicated whether they had ever received any modality of drug treatment (including abstinence-based and medication-assisted treatment (MAT)), with responses coded as: never; previously/not currently; and currently.

2.2.3.2. Recent Physical and Psychological Stressors: *Pain Severity* and *Pain Interference* with activities of daily living were assessed with the short Brief Pain Inventory (BPI). On a 10-point scale, participants rated their lowest, highest and average level of pain severity in the past 30 days, as well as the least, most and average extent to which pain interfered with their functioning over the past 30 days. For this analysis, the averages of these three pain ratings were taken, and the resulting variables were treated as continuous and centered at the mean.

Depression Symptoms.: Participants completed the depression sub-scale of the Patient Health Questionnaire (PHQ-9), an instrument commonly used in clinical settings to screen for depression. Items assess how often respondents have been bothered by 9 depression symptoms in the past 30 days, with responses ranging from 0 (Not at All) to 3 (Nearly Every Day). Following standard PHQ-9 scoring, participants' summary scores were coded into one of 5 severity categories: 0=Minimal or None; 1=Mild; 2=Moderate; 3=Moderately Severe; 4=Severe. The resulting variable was treated as continuous, but not centered at the mean.

Recent Stressful Life Events.: Participants completed a modified version of the 57-item Life Events Inventory (LEI) [58], indicating which events they had experienced in the past 30 days. For this analysis, we created a Stressful Life Events subscale from 8 of the life events from the LEI that have been considered the most stressful (i.e., divorce; family breakup involving children; new period of unemployment or loss of a job; new debt beyond one's means to repay; death or serious illness of a spouse; death or serious illness of a close friend or family member; new conviction/legal sentence; unsheltered/period of homelessness) [45] and two additional life events relevant to veterans using opioids: loss of housing (due to eviction or break-up, for example); and arrest or altercation with law enforcement. In addition to analyzing each of these 10 sub-scale items as a separate predictor variable, we created a subscale summary score that represents the number of stressful life events the respondent experienced in the last 30 days (range = 0-10); it was treated as continuous and centered at the mean.

2.3. Analytic Plan

All analyses were conducted in R. Individuals representing sociodemographic subgroups for which there was insufficient data for comparison were removed from the analysis; specifically, participants who reported being biracial (n=2), Asian-American (n=1) or Native American (n=2), a participant who reported being employed in criminal activity (n=1), participants who did not report their date of birth (n=3), and those currently living in inpatient treatment (n=4) were excluded from the analytic sample. The final analysis was conducted with data from 218 individuals.

Bivariable and multivariable analyses were conducted using Poisson regression (in the R package *sandwich*) to assess associations of ORBS score with the 15 hypothesized BPS

Page 7

predictor variables and 7 sociodemographic and medication-status control variables. Regression coefficients were exponentiated to obtain incidence rate ratios. Unadjusted incident rate ratios were obtained by running the Poisson regression with no other covariates in the model. Adjusted incident ratios were obtained with models that included the following control variables: age; gender; race/ethnicity; housing type; prescribed any sedating medication in the past 30 days; prescribed opioid medication for pain in the past 30 days; and received MMT in the past 30 days. Given the number of hypothesis tests that were conducted in this study, a Bonferroni correction for multiple hypothesis tests may be appropriate, and suggests that only those results with *p*-values below 0.00125 should be considered meaningful. Since this is an exploratory study, we have opted to report in Table 3 all associations found to be significant at p 0.05, but to limit our interpretation to only those associations with a significance level of 0.001 or below.

3. Results

3.1. Participant Characteristics

One-half of participants were between 21 and 34 years old and 25% were aged 35-44; the remainder were 45 or older. The majority of participants were male (84%) and Black, non-Hispanic (60%). Only 36% of participants were living in private housing at the time of enrollment; 37% were living in homeless shelters and 7% were unsheltered. Ten-percent of the study population were married; the remainder were single (53%), divorced (22%) or separated (15%). The majority of veterans in the sample were experiencing depression at time of enrollment. Only 27% reported no depression, while 74% reported experiencing mild to severe depression. While all participants were using opioids at the time of enrollment, 64% had never received any type of drug treatment and only 17% reported currently participating in drug treatment. Over one-half (57%) of the sample had ever received mental health treatment.

Participants endorsed a wide range of stressful life events in the 30 days prior to enrollment: 37% had lost a job or experienced a new period of unemployment; 24% had incurred a new debt beyond their means to repay; 19% had been unsheltered; 19% had experienced the death or serious illness of a close friend or family member; and 11% had altercations with law enforcement. Sample distributions for key sociodemographic characteristics and hypothesized BPS predictor variables are presented in Table 1.

3.2. Recent Engagement in Overdose Risk Behaviors

Participants reported engaging in an average of 4.72 of the 22 opioid OD-related risk behaviors assessed by ORBS in the past 30 days. The most frequently endorsed risk behaviors involved using POs for reasons other than as prescribed, including for sleep (on an average of 6.06 days in the past 30), to reduce anxiety (mean = 5.72 days/past 30) and for enjoyment or to "get high" (mean = 5.29 days/past 30), and using diverted POs not prescribed to oneself (mean = 5.85 days/past 30). Mixing opioids with alcohol was also a frequently endorsed behavior, reported on an average of 4.91 days in the past 30. The least frequently endorsed ORBS behaviors were using buprenorphine and other opioids on the same day (mean = 0.44 days/past 30) and using diverted methadone (mean = 0.46 days/past

30). Table 2 reports the mean number of days in the past 30 on which participants reported engaging in all ORBS behaviors.

3.3. Associations of Sociodemographic and Biopsychosocial Factors with ORBS Score

Significant independent predictors of increased engagement in OD risk behaviors include: living in a homeless shelter [AIRR: 1.69 (95% Cl: 1.25, 2.28)] or being unsheltered with no regular place to stay [AIRR: 2.08 (1.39, 3.13)]; having received mental health treatment in the past, but not currently (AIRR: 1.75 (1.27, 2.41)]; and higher than average past-30-day pain severity [AIRR: 1.13 (1.07, 1.20)] and pain interference [AIRR: 1.10 (1.05, 1.16)], all of which were associated with higher ORBS score (*p* 0.001).

Stressful life events were associated with ORBS score (at p 0.001) only in the aggregate, when expressed as a count of the number of stressful events experienced in the past 30 days; specifically, each stressful life event over the mean was associated with a 14% increase in ORBS score, holding all other variables constant. Of particular note, past-30-day depression symptomatology showed a graded relationship with ORBS score such that a mild level of depression symptoms (vs. minimal or no depression symptoms) was associated with a 110% increase in ORBS score, a moderate level was associated with a 158% increase in ORBS score, a moderate level was associated with a 222% increase in ORBS score, and a severe level of depression symptoms was associated with a 306% increase in ORBS score.

4. Discussion

This analysis focuses on a sample of community-recruited veterans who use opioids, the majority of whom reported serious physical or mental health problems after separating from the military and/or stressors associated with obtaining stable housing and employment. Findings suggest that psychological and physical pain, as well as social stress, are associated with increased engagement in opioid use behaviors that increase risk of OD. Although veterans' most frequently endorsed OD risk behaviors involved various forms of misuse of pharmaceutical opioids, having a recent PO prescription for pain was not significantly associated with higher ORBS score.

In this sample, psychological and social factors were significant predictors of risk behavior for OD, as was physical pain. For example, depressive symptoms were associated with a 110-306% increase in ORBS score, depending on the level of severity, and having previously sought treatment for mental health concerns was associated with a 75% increase in ORBS score. We hypothesize that, in this analysis, receipt of mental health treatment is likely functioning as a proxy for experiencing mental health problems. These findings extend previous research suggesting that depressive symptoms may predict opioid misuse [55, 56] and that chronic opioid use may induce or exacerbate depressive symptoms [59–61]. This suggests that mental health screening before and after opioid prescribing may help reduce veterans' opioid misuse and OD risk. Unstable housing, a common social stressor in this sample, also predicted increased engagement in OD risk behavior; living in a homeless shelter was associated with a 69% higher ORBS score, while being unsheltered increased ORBS score by 108%. Higher than average pain severity and pain interference were also significant predictors of greater engagement in OD risk behavior; although the magnitude

of these effects was small. While certain OD risk factors identified in this analysis, such as symptoms of depression, may be sequelae or consequences of OUD – particularly untreated OUD – this is unlikely to be the case for all the BPS factors found to predict OD risk behavior.

The VA has taken a robust approach to help veterans deal with biopsychosocial challenges, including wrap-around services, expansion of MAT, OD education and naloxone distribution (OEND) programs and holistic health approaches [62]. Moreover, the VA has greatly reduced the number of prescriptions for POs and recent guidelines advise against the concurrent prescribing of other drugs that may increase risk for OD, including benzodiazepines [17, 20, 63]. While these efforts have, no doubt, helped to curb rates of opioid misuse among veterans, those who do not utilize the VA (due to loss of benefits related to less-than-honorable discharge status, inability to navigate the bureaucracy of establishing service-related injury or mental health conditions, or conscious avoidance [e.g. stigma]) should be equally able to receive current evidence-based treatments.

The need for robust and interconnected government programs that provide health and social support are of crucial importance for veterans' well-being. Previous government initiatives, such as the Vow to Hire Heroes Act and Veterans Employment Initiative [64], have attempted to address veteran unemployment and incentivize their employment, as Housing and Urban Development-Veterans Affairs Supportive Housing (HUD-VASH) has assisted with veteran housing and substance use and mental health services [65, 66]. The expansion of VHA, Housing Authorities, Departments of Health and other public/private sector agency programs servicing veterans need to coordinate among each other and with veterans to ensure a holistic, low-threshold safety net is enhanced and maintained for veterans who are in need. These types of collaborations could further assist veterans and help protect against many of the harmful outcomes associated with PO misuse, as well as the use of other opioids (e.g. heroin, illicitly manufactured fentanyl and related analogues).

4.1. Limitations

This study's use of non-probabilistic sampling methods may reduce the generalizability of the findings. Given the lack of community samples of veterans in the extant literature, however, the predominantly-minority, urban sample of opioid-using veterans is also a strength. It is important to note that the prevalence of OD risk behaviors found in this study (4.72 on average in the past 30 days) is based on a sample of veterans who reported recent opioid use; therefore, it is expected to be higher than would be found in a general sample of NYC veterans not selected on the basis of their recent opioid use. Additionally, the present sample may not be generalizable to all opioid-using, post-9/11 military veterans – not only were all veterans in the present study recruited from NYC, the sample also contains a preponderance of unstably housed veterans, therefore, BPS risk factors may be more prevalent in this sample than in other samples of veterans.

Measurement of OD risk behaviors is a relatively new focus for public health instrumentation. A limitation of this analysis is that all ORBS items are weighted equally, which may overvalue less risky behaviors and undervalue riskier behaviors. Also, all ORBS behaviors and BPS constructs were assessed by self-report and, as such, are subject to recall

and/or social desirability bias; this may be especially true for participants' reports of engagement in OD risk behaviors, given the stigmatized nature of drug use. As discussed in section 2.7, our analysis may be limited by Type I error due to the number of hypothesis tests that were conducted. However, our conservative interpretation strategy informed by the Bonferroni correction (i.e., only associations with a significance level below 0.00125 are considered meaningful) reduces this concern.

5. Conclusions

This analysis further suggests the impact of biopsychosocial factors on veterans' OD risk behavior. Depression, unstable housing, prior mental health treatment, physical pain and stressful life events all appear to be relevant, more distal factors that are correlated with risk factors for OD—the discrete sub stance-related behaviors known to precipitate OD. Future longitudinal research is recommended in order to better disentangle the complex interrelationships among proximal and distal OD risk factors and identify potential mediators that may Sanction to exacerbate or attenuate relationships between upstream risk factors and proximal OD risk behaviors. This research should include comparative designs that focus on urban and rural veterans, as well as veterans living in multiple geographic areas throughout the U.S. While the expansion of evidence-based treatment options remains paramount, findings suggest the importance of addressing opioid misuse and OD risk as part of a broader complex of stressors veterans face as they readjust to civilian life, attempt to locate housing and employment, and establish supportive personal, clinical and institutional relationships. This may best be achieved through the bolstering of low-threshold, community-based services accessible to all veterans.

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Highlights:

- U.S. military veterans are a population at elevated risk for fatal and non-fatal overdose.
- Biopsychosocial challenges are associated with behaviors that increase risk for overdose.
- Participants reported an average of 4.72 OD risk behaviors in the past-30 days.
- Predictors of OD risk: pain severity/interference; mental health challenges; stressful life events.
- Low-threshold, collaborative, and holistic interventions are needed to mitigate these risks.

Table 1.

Characteristics of Opioid-using Veterans in New York City (n=218)

		,		
Continuous Predictors	M (SD)	Correlation with ORBS Score		
Pain Severity (BPI; 0-10)	5.22 (2.17)	[.13 (.26) .38]		
Pain Interference (BPI; 0-10)	4.57 (2.57)	[.17 (.30) .42]		
Number Stressful Life Events (past 30 days)	1.42 (1.44)	[.18 (.31) .43]		
PHQ-9 Depression subscale score (past 30 days, 0-36)	9.14 (6.66)	[.39 (.50) .59]		
Categorical Predictors	N (%)	ORBS Score M (SD)		
- Full Sample	218	7.65 (7.02)		
Age: 21-34	110 (50%)	7.15 (6.83)		
Age: 35-44	55 (25%)	7.96 (7.02)		
Age: 45-60	53 (24%)	8.36 (7.45)		
Gender: Male	183 (84%)	8.27 (7.29)		
Gender: Female	35 (16%)	4.40 (4.09)		
Race/Ethnicity: Black, not Hispanic	131 (60%)	6.75 (6.61)		
Race/Ethnicity: Hispanic or Latino	49 (22%)	8.51 (7.51)		
Race/Ethnicity: White, not Hispanic	38 (17%)	9.63 (7.39)		
Current prescription for any sedating medication	135 (62%)	7.67 (7.31)		
Current opioid prescription for pain	101 (46%)	7.56 (7.37)		
Currently in methadone maintenance treatment for OUD	17 (8%)	11.24 (8.27)		
Housing: Private Home or Apartment	78 (36%)	5.37 (5.08)		
Housing: Public Housing	21 (10%)	8.67 (7.09)		
Housing: Transitional Housing/SRO	22 (10%)	5.36 (5.64)		
Housing: In Homeless Shelter	81 (37%)	9.40 (7.86)		
Housing: Unsheltered	16_(7%)	11.69 (8.34)		
Marital Status: Married, Living with Spouse	22 (10%)	4.91 (6.86)		
Marital Status: Separated	33 (15%)	7.82 (7.14)		
Marital Status: Divorced	48 (22%)	8.98 (7.53)		
Marital status: Single	115 (53%)	7.57 (6.73)		
PHQ-9: (No/Minimal Depression)	59 (27%)	3.29 (3.91)		
PHQ-9: (Mild Depression)	68 (31%)	7.03 (5.82)		
PHQ-9: (Moderate Depression)	43 (20%)	8.40 (6.11)		
PHQ-9: (Moderately Severe Depression)	33 (15%)	12.73 (8.96)		
PHQ-9: (Severe Depression)	15 (7%)	14.27 (7.18)		
Never received mental health treatment	94 (43%)	5.20 (6.18)		
Previously received mental health treatment, but not in last 30 days	63 (29%)	10.19 (6.40)		
Currently receiving mental health treatment	61 (28%)	8.79 (7.69)		
Never received drug treatment	139 (64%)	6.40 (6.66)		
Previously received drug treatment, but not in past 30 days	41 (19%)	10.00 (6.94)		
Currently receiving drug treatment	38 (17%)	9.66 (7.44)		
Stressful Life Events in the past 30 days				

Continuous Predictors	M (SD)	Correlation with ORBS Score
Death or serious illness of spouse	4 (2%)	16.00 (12.36)
Death or serious illness of a close friend or family member	41 (19%)	9.10 (8.30)
Altercation with law enforcement/arrest	23 (11%)	12.61 (8.00)
New conviction/legal sentence	7 (3%)	16.29 (11.76)
Lost job/New period of unemployment	80 (37%)	8.14 (6.97)
New debt beyond means to repay	53 (24%)	7.87 (7.15)
Went unsheltered in last 30 days	41 (19%)	9.46 (8.41)
Lost Housing (due to eviction or break-up, for example)	21 (10%)	12.76 (8.20)
Divorce	15 (7%)	11.47 (7.17)
Family Breakup involving children	11 (5%)	12.27 (11.24)

Table 2.

Baseline Frequency of Past-30-Day Overdose Risk Behaviors among Opioid-using Veterans in New York City (n=218)

Overdose Risk Behavior Scale (ORBS) Item	N	Mean	Std. Dev.	Min	Pctl(25)	Pctl(75)	Max
Used POs [*] for Sleep	218	6.06	9.013	0	0	10	30
Used Non-prescribed POs	218	5.853	8.575	0	0	9.8	30
Used POs for Anxiety	218	5.72	9.187	0	0	7	30
Used > Prescribed Amount While Alone	218	5.362	8.854	0	0	7	30
Used POs for Enjoyment	218	5.289	8.599	0	0	7	30
Used Alcohol & Opioids on Same Day	218	4.908	7.955	0	0	7	30
Used Benzodiazepines & Opioids on Same Day	218	3.959	8.33	0	0	2	30
Used Heroin	218	3.22	7.473	0	0	1	30
Used Sleep Meds & Opioids on Same Day	218	3.055	7.338	0	0	0.8	30
Used Heroin Alone	218	2.528	6.759	0	0	0	30
Used Methadone from any Source	218	2.234	7.195	0	0	0	30
Used Alcohol, Benzos, & Opioids on Same Day	218	2.174	5.666	0	0	0	30
Used More POs than Directed	218	2.138	5.59	0	0	1	30
Used Alcohol, Sleep Meds, & Opioids on Same Day	218	2.115	5.803	0	0	0	30
Injected Heroin or Other Opioids	218	2.023	6.805	0	0	0	30
Used Stimulants to Counteract Opioids	218	1.706	4.911	0	0	0	30
Used Heroin & POs	218	1.587	5.381	0	0	0	30
Snorted POs	218	1.183	4.383	0	0	0	30
Used Methadone & Other POs on Same Day	218	1.151	4.745	0	0	0	30
Injected POs	218	0.716	3.839	0	0	0	30
Smoked/Vaporized POs	218	0.509	2.903	0	0	0	30
Used Buprenorphine & Other POs on Same Day	218	0.445	3.24	0	0	0	30

^{*r*}POs = prescription opioids.

Table 3.

Associations of Sociodemographic and Biopsychosocial Variables with Veterans' Overdose Risk Behavior Scale (ORBS) Scores (n=218)

Variables	ORBS Scor N (%) (SD)				Incidence Rate Ratio (95% CI)	Adjusted Incidence Ratio [#] (95% CI)	
Control Variables				*			
Age							
21-34	110 (50%)	7.15 (6.83)					
35-44	55 (25%)	7.96 (7.02)	1.11 (.83, 1.50)	1.15 (.87, 1.51)			
45-60	53 (24%)	8.36 (7.45)	1.17 (.87, 1.58)	1.03 (.75, 1.41)			
Gender							
Male	183 (84%)	8.27 (7.29)					
Female	35 (16%)	4.40 (4.09)	0.53 (.38, .75) ***	.59 (.42, .83) **			
Race/Ethnicity							
Black, Not Hispanic	131 (60%)	6.75 (6.61)					
Hispanic	49 (22%)	8.51 (7.51)	1.26 (.93, 1.70)	1.20 (.90, 1.60)			
White, Not Hispanic	38 (17%)	9.63 (7.39)	1.42 (1.06, 1.92)*	1.33 (.99, 1.78) +			
Type of Housing							
Private Apartment or House	78 (36%)	5.37 (5.08)					
Public Housing	21 (10%)	8.67 (7.09)	1.61 (1.06, 2.45)*	1.57 (1.04, 2.37) *			
Transitional Housing/SRO	22 (10%)	5.36 (5.64)	1.00 (.61, 1.64)	.91 (.54, 1.52)			
Homeless shelter	81 (37%)	9.40 (7.86)	1.75 (1.32, 2.31) ***	1.69 (1.25, 2.28) ***			
No Housing	16_(7%)	11.69 (8.34)	2.18 (1.43, 3.31) ***	2.08 (1.39, 3.13) ***			
Prescribed Any Sedating Medication (past 30 days)	135 (62%)	7.67 (7.31)	1.01 (.79, 1.29)	.98 (.70, 1.36)			
Prescribed Opioid Pain Medication (past 30 days)	101 (46%)	7.56 (7.37)	.98 (.76, 1.26)	1.12 (.81, 1.55)			
Currently in Methadone Maintenance Treatment	17 (8%)	11.24 (8.27)	1.53 (1.04, 2.24)*	1.34 (.95, 1.89) +			
Biopsychosocial Predictor Variables							
Treatment History							
History of Mental Health Treatment							
Never received	94 (43%)	5.20 (6.18)	-	-			
Previously received, not currently	63 (29%)	10.19 (6.40)	1.96 (1.47, 2.61) ***	1.75 (1.27, 2.41)****			
Currently receiving	61 (28%)	8.79 (7.69)	1.69 (1.22, 2.34) **	1.72 (1.21, 2.44)**			
History of Drug Treatment							
Never received	139 (64%)	6.40 (6.66)	-	-			
Previously received, not currently	41 (19%)	10.00 (6.94)	1.56 (1.18, 2.06)***	1.38 (.99, 1.93) +			
Currently receiving	38 (17%)	9.66 (7.44)	1.51 (1.11, 2.04) **	1.24 (.86, 1.80)			
Recent Physical and Psychological Stressors							

Brief Pain Index (BPI; past 30 days)

Variables	N (%)	ORBS Score M (SD)	Incidence Rate Ratio (95% CI)	Adjusted Incidence Rate Ratio [#] (95% CI)
Pain Severity (0-10)			1.12 (1.06, 1.19)***	1.13 (1.07, 1.20) ***
Pain Interference (0-10)			1.11 (1.06, 1.16)***	1.10 (1.05, 1.16) ***
Depression Symptoms in Past 30 Days (PHQ-9)				
Minimal or No Depression	59 (27%)	3.29 (3.91)		
Mild Depression	68 (31%)	7.03 (5.82)	2.14 (1.48, 3.08)****	2.10 (1.49, 2.96) ***
Moderate Depression	43 (20%)	8.40 (6.11)	2.55 (1.75, 3.72) ***	2.58 (1.72, 3.87) ***
Moderately Severe Depression	33 (15%)	12.73 (8.96)	3.87 (2.62, 5.73) ***	3.22 (2.21, 4.69) ***
Severe Depression	15 (7%)	14.27 (7.18)	4.34 (2.90, 6.50) ***	4.06 (2.62, 6.29) ***
Stressful Life Events in Past 30 Days				
Family Problems				
Divorce	15 (7%)	11.47 (7.17)	1.56 (1.09, 2.21) *	1.41 (.93, 2.12)
Family Breakup Involving Children	11 (5%)	12.27 (11.24)	1.66 (.93, 2.96) +	1.34 (.76, 2.37)
Economic Stressors				
New period of unemployment/loss of a job	80 (37%)	8.14 (6.97)	1.11 (.86, 1.42)	1.07 (.81, 1.41)
New debt beyond means to repay	53 (24%)	7.87 (7.15)	1.04 (.78, 1.38)	1.14 (.86, 1.52)
Death or Serious Illness of Loved Ones				
Death or serious illness of spouse	4 (2%)	16.00 (12.36)	2.14 (.88, 5.16) +	1.90 (.75, 4.83)
Death or serious illness of close friend or family member	41 (19%)	9.10 (8.30)	1.24 (.91, 1.70)	1.26 (.95, 1.68)
Legal/Justice System Encounters				
Altercation with law enforcement/arrest	23 (11 %)	12.61 (8.00)	1.79 (1.33, 2.40) ***	1.64 (1.20, 2.24) **
New conviction/legal sentence	7 (3%)	16.29 (11.76)	2.21 (1.23, 3.99)**	1.94 (1.02, 3.71) *
Housing Problems ^{##}				
Went unsheltered	41 (19%)	9.46 (8.41)	1.80 (1.32, 2.45)***	1.51 (1.09, 2.11) *
Lost housing (e.g., due to eviction or break- up)	21 (10%)	12.76 (8.20)	1.31 (.96, 1.78) +	1.30 (.98, 1.98) +
Count of Stressful Events in Past 30 Days				
			1.16 (1.08, 1.24) ***	1.14 (1.06, 1.23)****

[#]Adjusted Rate Ratios controlled for Age, Gender, Race, Type of Housing, Prescription for Sedating Medication, Prescription for Opioids, and Participation in Methadone Maintenance Treatment.

Adjusted Rate Ratios for both housing-related predictors (Went unsheltered, Lost housing) did not control for Type of Housing.

⁺p 0.1

* p 0.05

** p 0.01

*** p 0.001