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JUSTICE INVOLVEMENT, OPIOID USE, AND CO-OCCURRING MENTAL
HEALTH DISORDERS: IMPLICATIONS FOR TRANSDIAGNOSTIC TREATMENT

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ABSTRACT

Opioid use disorder (OUD) is disproportionately prevalent among justice involved groups, related to justice involvement above and beyond other substances, and associated with severe co-occurring mental health disorders that exacerbate behavioral and legal outcomes. Past studies examining mental health disorders, OUD, and justice involvement have been limited by an overly broad or strictly categorical approach to diagnostic operationalization. Further, extant treatment of co-occurring disorders among justice involved groups lacks specificity, such that interventions are lengthy and not targeted towards the most impairing mental health symptoms. An examination of transdiagnostic symptoms affecting justice involved individuals with OUD is warranted.

Structured and semi-structured clinical diagnostic interviews were conducted among a 50-person sample of adults receiving medication for OUD (MOUD). Additionally, history of arrest was assessed in the style of a life events calendar. Regression and moderation analyses were employed to examine the associations among substance use disorder, opioid use disorder, mental health symptoms/diagnoses, and arrest history. We expected arrest history to moderate the relationship between domains of co-occurring disorders and substance use.

Contrary to hypotheses, no significant effects were found in study models. Implications in the context of assessment, intervention, and justice involvement are discussed. Additional work among a larger, more representative sample is necessary to disentangle symptom-level associations among vulnerable, substance using groups in the justice system.

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CHAPTER 1: INTRODUCTION

Opioid Use Disorder

Approximately 1.9 million adults in the United States meet criteria for Opioid Use Disorder (OUD) (SAMHSA, 2019). The term opioid refers to an endogenous or exogenous substance that interacts with opioid receptors in the brain, a process that may elicit pain relief and euphoria (Waldhoer et al., 2004). Opioids include both naturally occurring *opiates* such as morphine and codeine, as well as synthetic opioids such as heroin (semi-synthetic, processed from morphine) and fentanyl (Trescot et al., 2008). A robust analgesic, opioids were pushed by advocates for pain relief in the medical community and prescribed at rates that increased exponentially following their initial promotion in the 1990s (Kanouse & Compton, 2015). Due in part to opioid receptor's involvement in neural reward processing (Darcq & Kieffer, 2018) opioids are particularly potent and pose high risk for both physiological dependence and psychological addiction (Evans & Cahill, 2016).

Consequently, opioid use disorder (OUD) has emerged as a severely damaging pathology pervading public health, economic, and legal domains. According to a national survey conducted by the Substance Abuse and Mental Health Administration (SAMHSA), 9.6 million Americans misused opioids, including prescription pain relievers and heroin, in 2018. This incidence has increased substantially over past decades (Kanouse & Compton, 2015), contributing to a surge in opioid related deaths, the rate of which has risen by almost 300% since 2001 (Gomes et al., 2018). Adding to this growth is a widespread rate of overdose death involving opioids. In 2016, synthetic opioids such as carfentanil and fentanyl surpassed prescription opioids as the most frequent drug involved in overdose

related death (Jones et al., 2018). Recent research suggests that the true incidence of overdose deaths likely exceeds estimated rates (Boslett et al., 2019).

As detailed in the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; APA 2013), OUD may include symptoms of tolerance and dependence, as well as behaviors such as failed attempts to reduce frequency of use, social, occupational, or recreational impairment, and excessive time spent in activities related to or including use (APA 2013). In 2017, the president of the United States labeled OUD and growing opioid use a public health emergency (whitehouse.gov). These trends implicate OUD as an unprecedented detriment to public health, a designation further corroborated by the economic impact of OUD in the United States.

Florence et al. (2016) estimated that the economic burden of prescription opioid overdose, dependence, and use as of 2013 was \$78.5 billion. Approximately 10% of this figure was attributed to criminal justice costs, of which the largest proportion was expenditure related to correctional facilities, a portion funded predominantly (96%) by the public sector. In addition to criminal justice costs, lost productivity for incarcerated individuals comprised 5.3% of the total economic burden. Thus, roughly 15% of the total economic burden of prescription opioid use can be attributed to concerns pertaining to criminal justice and incarceration. Indeed, OUD is linked to justice involvement to a great degree.

Defining Justice Involvement

Correctional supervision encompasses individuals living under variable degrees of oversight provided by a state or federal department of corrections. This includes those in jails, which hold individuals temporarily while awaiting transfer or sentencing or for short

sentences (e.g., less than a year), as well as prisons, which house those for long term sentences (NIJ, 2020). Across these facilities, the U.S. incarcerates more individuals per 100,000 than all other similarly developed nations (Wagner & Sawyer, 2018).

Outside of correctional facilities, correctional supervision further entails those on probation or parole, during which individuals remain in the community but receive supervision from treatment providers and probation/parole officers (e.g., outpatient services, Johnson et al., 2011). These programs typically involve mandated practices, such as financial restitution, drug testing, and/or requirements regarding employment and housing (Gayman et al., 2018; Morash et al., 2019). Indeed, most individuals under correctional supervision are currently on probation or parole (Kaeble et al., 2015), a tenuous time during which adults are likely to either violate conditions of probation/parole or commit a new offense (Prell et al., 2016). These risks are amplified among those with mental health disorders; individuals on parole with a serious mental illness (e.g., major depression) on average return to prison almost a year sooner than those without serious mental illnesses. Those with mental health disorders are also more likely to be re-incarcerated due to violations of conditions of parole, highlighting the need for correctional practice informed by mental health needs (Cloyes et al., 2010).

These various domains of correctional supervision represent opportunities to provide mental health interventions to the vulnerable populations who come into contact with corrections. Indeed, following deinstitutionalization, the number of individuals with mental health disorders in correctional institutions has surpassed that of mental health institutions (Kim, 2016), with prisons being called the “nation’s largest mental health institution” (Al-Rousan et al., 2017). This label is corroborated by the disproportionate

incidence of substance use (SUD) and co-occurring mental health disorders among those under correctional supervision, hereafter referred to as justice involved.

Substance Use and Justice Involvement

SUD is widespread across areas of justice involvement. Within prison, frequent SUD include Alcohol Use Disorder, (Fazel et al., 2017), cannabis use disorder, stimulant use disorder, and OUD (Proctor, 2012). Half of currently incarcerated individuals will use substances recreationally at least once during incarceration (Simpler & Langhinrichsen-Rohling, 2005). Similarly, between 35% and 45% of individuals on probation or parole endorse substance use or dependence (Feucht & Gfroerer, 2011; Lipari & Gfroerer, 2014). The prevalence of substance use among these groups is particularly concerning given the role of substance use in extant models of risk, or the likelihood of re-offense.

The Risk-Needs-Responsivity (RNR) model emphasizes treatment and intervention that is tailored to meet “Needs,” dynamic factors which may mitigate the likelihood of recidivism among those with the highest “Risk”: static factors that increase chances of re-offense. This more personalized approach is labeled Responsivity. Proponents of this model have identified antisocial-cognitions, -behavior, -personality, and -peers, as well as education, family, leisure activities, and substance use (Bonta & Andrews, 2007) as major predictors of recidivism. Substance use increases the likelihood of re-offending fourfold (Bennett et al., 2008; Sullivan et al., 2007), and near half of the 1.5 million incarcerated adults in the United States are sentenced for drug related offenses (Bronson & Carson, 2019). Further, those incarcerated for non-drug related offenses participate in comparable levels of substance use during incarceration, suggesting an association between substance use and justice involvement beyond a punitive response to drug related offenses (Simpler

& Langhinrichsen-Rohling, 2005). In addition to its magnitude as a public health epidemic, opioid use has demonstrated a significant, disproportionate association with justice involvement.

Opioid Use and Justice Involvement

At least a quarter of those in prisons and jails report the use of opioids, and prevalence is increasing (Bronson, et al., 2017). Underscoring the magnitude of links between opioid use and justice involvement, Winkelman et al. (2018) found that over half of those with an OUD in a nationally representative community sample reported contact with the justice system. Moreover, involvement with the criminal justice system was greater as severity of opioid use increased. While co-occurring polysubstance use amplifies (i.e., moderates) the relationship between OUD and justice involvement, Winkelman et al. (2018) found a statistically significant direct effect of OUD on justice involvement.

This unique association between OUD and justice involvement makes the need for OUD treatment among justice involved individuals clear. The sole evidence-based treatment for OUD is medication for OUD (MOUD; previously called medication assisted treatment; Connery, 2015), such as methadone, a full opioid agonist, buprenorphine, a partial agonist, and naltrexone, an antagonist (Moore et al., 2019). In community samples, MOUD is associated with reductions in opioid use and both overdose and non-overdose related mortality (Sordo et al., 2017). Despite these demonstrated benefits, MOUD is not consistently available for those under correctional supervision. In the community, less than 5% of individuals referred from courts and diversionary programs receive MOUD (Krawczyk et al., 2017), a doubly concerning rate given the increased likelihood of death by opioid overdose following release (Binswanger et al., 2013). In a survey of nationwide

prisons, Nunn et al., (2009) found that approximately 55% of prisons offer methadone, and fewer offer buprenorphine, to incarcerated individuals. However, half of the latter sample exclusively provided methadone to pregnant women or those experiencing chronic pain. Fortunately, MOUD implementation across areas of justice involvement in and outside of correctional facilities (e.g., drug court; Green et al., 2018; Hyatt & Lobmaier, 2020), is increasing.

When provided to justice involved individuals, MOUD is associated with positive outcomes. In addition to enhancing treatment provided during incarceration, MOUD appears to benefit those in the precarious post-release period, during which substance-related death and re-entry risk is high (Cloyes et al., 2010; Prell et al., 2016). In a review and meta-analysis of MOUD implementation across correctional facilities, Moore et al. (2019) found that MOUD delivered during incarceration increased the likelihood of engagement in treatment after release and decreased the frequency of non-prescribed opioid use. However, those who engage in MOUD post-release were not less likely to recidivate (Moore et al., 2018). As delivery of MOUD is refined, an additional avenue through which to lessen outcomes such as recidivism is treatment of co-occurring disorders alongside OUD justice settings.

Co-Occurring Disorders in Corrections

Mental health disorders occur more frequently among justice involved individuals than among those in the community. Approximately 15-31% of adults in jails (Steadman et al., 2009) and near half of adults in prison (Al-Rousan et al., 2017) have a mental health disorder. Additionally, 25-46% of those in prison meet criteria for co-occurring substance use and mental health disorders (Butler et al., 2011). This co-occurrence of substance use

and mental health disorders has commonly been referred to as dual diagnosis (e.g., Edens et al., 1997). However, the term “dual diagnosis” has been criticized for its vagueness and at times refers to poly-substance use rather than mental health and SUD specifically (SAMHSA, 2020); hereafter mental health disorders in combination with SUD will be referred to as co-occurring disorders.

OUD is significantly associated with co-occurring mental health disorders. In the community, 10-24% of individuals with OUD have a co-occurring SUD, and about 65% have a co-occurring mental health disorder; this frequency persists across specific opioid type (i.e. prescription opioid only, heroin only; Jones & McCance-Katz, 2019). Common mental health disorders among those with OUD include major depressive episodes (MDE) and generalized anxiety disorder (GAD), among others (Barry et al., 2016; Sullivan, 2018).

Within justice involved groups, a similar relationship emerges. For example, women on parole who meet criteria for PTSD are 60% more likely to use opioids than those without PTSD, and this opioid use is related to greater general psychological distress above and beyond PTSD symptoms (Hall et al., 2016). Over half of opioid using individuals with a history of incarceration meet criteria for major depressive disorder (Robertson et al., 2018). Among a sample in treatment court, a diversion program which prioritize SUD treatment, Shaffer et al. (2020) found that 71% of individuals reported opioid use, and the majority of that group endorsed symptoms of both depression (68.5%) and anxiety (74%). This high incidence of co-occurring mental health disorders appears to worsen behavioral and justice related outcomes among justice involved individuals.

Co-Occurring Disorders and their Outcomes

A combination of co-occurring disorders and OUD exacerbates behavioral outcomes among justice involved individuals. For example, the presence of a co-occurring mental health and substance use disorder is associated with a greater risk of injury (Young et al., 2018), self-harm (Young et al., 2020), and non-fatal overdose following release. In particular, the presence of co-occurring disorders is more predictive of non-fatal overdose compared to substance use disorder or mental health disorders alone (Keen et al., 2020). Within facilities, co-occurring disorders predict assault, misconduct, and victimization (Wood, 2018). Finally, the psychological distress associated with co-occurring disorders is related to more severe OUD among incarcerated adults (Knighton et al., 2018), suggesting that co-occurring disorder treatment may mitigate some symptoms of OUD.

Co-occurring disorders also appear to exacerbate legal outcomes, such as recidivism. Of note, the RNR model does not identify mental health disorders as a major risk factor for re-offense, as they do not independently predict risk of offending (Andrews et al., 2006). However, evidence suggests the co-occurrence of mental health and substance use disorders is related to parole revocation and incarceration beyond substance use or mental health disorders alone (Baillargeon et al., 2009, 2010; Skeem et al., 2014). For example, those with both PTSD and a SUD are more likely to recidivate than those with a SUD (Kubiak, 2004). Ogloff et al. (2015) found that – compared to individuals without co-occurring disorders – those with co-occurring disorders were more likely to have violently offended, used substances prior to offending, and have a greater history of incarceration. Co-occurring disorders are also associated with other components of the RNR model, such as antisocial peers, unemployment, and a greater number of previous arrests (Sung et al.,

2010). It follows that treatment targeting co-occurring disorders may mitigate legal consequences such as recidivism and misconduct.

Treatment of Co-Occurring Disorders in Corrections

Despite their association with aggravated behavioral and criminal justice outcomes, the majority of incarcerated populations with co-occurring disorders will not receive any form of treatment. An estimated 11% of those who are incarcerated and meet criteria for a SUD are receiving treatment; the majority of that treatment is not evidence-based (The National Center on Addiction and Substance Abuse, *Behind Bars*, 2010). Numerous barriers to treatment among those with co-occurring disorders exist, including stigma around treatment/treatment providers, misdiagnosis of the co-occurring disorder, availability of treatment, and inadequate provider training (Priester, et al., 2016). These barriers appear to be compounded among those who are incarcerated (Morgan et al., 2007; Reingle Gonzalez & Connell, 2014) or undergoing reentry into the community, particularly among individuals released from jails, which entail significantly shorter terms than prisons (Begun et al., 2016).

While infrequent, interventions designed to support those with co-occurring disorders have been implemented to modest success; the majority of them appear to include skill building targeting areas of the RNR model. Among samples in jail, an intervention comprised of psychiatry services, psychoeducation, support groups, life skills training, transition planning, and community support saw reductions in likelihood of re-offense within a year. However, 67% of participants were re-incarcerated within 5 years (Rothbard et al., 2009). A separate program, which emphasized the use of familial social support,

yielded decreased rates of substance use among those incarcerated in jail (Spjeldnes et al., 2012).

Interventions delivered in prisons similarly address the pre- and post-release period. For example, the Therapeutic Community intervention entails (1) living in a substance-free residential unit within the prison, (2) becoming employed in the community while continuing to live on the unit, and (3) living in the community under the supervision of a parole or probation officer (De Leon et al., 2015). This intervention is associated with a decreased number of crimes committed and rate of reincarceration following release (Sacks et al., 2012). Further, Therapeutic Communities are associated with decreased substance and alcohol use post-release, including use of opioids (Sullivan et al., 2007).

Additional interventions targeting co-occurring disorders among justice involved individuals include those administered in diversion programs, during which justice involved individuals are referred to programming within the community, rather than incarceration. For example, the “Maintaining Independence and Sobriety through Systems Integration, Outreach, and Networking-Criminal Justice” (MISSION-CJ) program is delivered in drug court, a faction of the court system which offers supervision and treatment for individuals who have committed offenses and have SUD (e.g., Hyatt & Lobmaier, 2020). The MISSION-CJ program, like other interventions among this population, includes peer and educational support, assessment of criminogenic needs (i.e., as outlined by RNR model; Bonta & Andrews, 2007), trauma-informed care, and integrated SUD and co-occurring disorder treatment. Delivery of this program is associated with reductions in symptoms of depression, anxiety, PTSD, and substance use (Pinals et al., 2019), as well as modest, nonsignificant decreases in opioid and injection drug use (Shaffer et al., 2020).

Studies which have examined OUD specifically, alongside co-occurring disorders, yield important implications for future work. Robertson et al. (2018) examined outcomes associated with MOUD delivery among justice involved individuals and found that MOUD was not independently associated with reduction in recidivism rates. Conversely, Shaffer et al. (2020) integrated co-occurring disorder therapy alongside MOUD in a primarily opioid using drug court sample, and noted reductions in recidivism, opioid use, and symptoms of PTSD, suggesting the importance of co-occurring disorder treatment in this population. However, the treatment program referenced was designed for substance use generally, future interventions may benefit from identifying OUD specific co-occurring disorder symptoms, given OUD's unique association with justice involvement and severity in the community.

Despite the noteworthy positive outcomes of this previous work, these interventions are not without limitations. First, previous studies have not examined outcomes as they differ according to SUD or co-occurring disorder and tend to prescribe programming broadly across mental and behavioral health issues. Indeed, little work has addressed OUD and co-occurring disorders among justice involved groups specifically, despite significant relationships to justice involvement above and beyond other substances, health, and demographic variables (Winkelman et al., 2018). Given variable treatment approaches to mental health disorders such as anxiety and depression, the isolation of treatment mechanisms within broader treatments like the therapeutic community program (Sullivan et al., 2007), which was associated with reductions in opioid use, would assist in intervention delivery within the time-limited nature of some areas of justice involvement.

Additionally, many treatments delivered among areas of justice involvement suffer from significant attrition. In a treatment program delivered pre- and post-release from a correctional facility, both Messina et al. (2010) and Rothbard et al. (2009) found only around 50% of their sample attended any post-release treatment sessions. Johnson and Zlotnick (2012), who examined treatment of depression alongside SUD pre and post-release, noted that only 37% of their sample attended 5 out of 6 post-release treatment sessions. In addition to treatment dropout, the time-sensitive nature of incarceration highlights a need for effective, shorter term mental SUD and co-occurring disorder treatment.

Finally, many studies have employed substandard assessment of mental health disorders, such as the use of self-reports rather than semi-structured clinical interviews (e.g., Pinals et al., 2019), despite the added value of clinical interviews for identifying symptoms of disorders such as depression (Stuart et al., 2014), a particularly common co-occurring disorder. More thorough assessment and specificity paid to this population could contribute to better-informed mental health interventions via a focus on the most distressing and impairing symptoms, rather than categorical classification of mental health disorders. Subsequently, an additional limitation of previous work in this area is a categorical approach to the classification of mental illness and substance use.

Dimensionality in Mental Health Disorders

Through its many iterations, DSM revisions have included addition and exclusion of disorders and criteria, but not alteration to the manual's largely categorical taxonomy on which mental health disorder classification relies. However, efforts in recent decades have reflected a shift towards the valuation of dimensional, rather than categorical, classification

(Brown & Barlow, 2005). Categorical classification involves the application of boundaries around sets of symptoms, the number of which may imply the presence or absence of a mental health disorder (APA, 2013). Conversely, a dimensional approach to mental illness classification emphasizes the frequent co-morbidity between mental health disorders, conceptualizing of mental illness in a continuum of symptoms, rather than a dichotomous variable. For example, the National Institute of Mental Health's Research Domain Criteria (RDoC) initiative was created to reclassify disorders dimensionally, according to their biological markers. (Kozak & Cuthbert, 2016). Both categorical and dimensional approaches may be represented, for example, many mental health disorders include severity ratings which reflect the continuous nature of their symptoms (e.g., OUD, APA 2013).

Evidence for the dimensionality of mental health disorders is represented in the significant co-morbidity of depression and anxiety symptoms (Barlow & Campbell, 2000). Generalized Anxiety Disorder (GAD) encompasses excessive worry or fear around numerous domains (e.g., physical health, interpersonal interaction), physiological symptoms of such worry (e.g., muscle tension, restlessness), difficulty controlling such worry, and general impairment, among other symptoms (APA, 2013). Major Depressive Episodes encompasses a period, lasting at least 2 weeks, of depressed mood or loss of interest in usual activities, in addition to symptoms such as insomnia, agitation, fatigue, worthlessness, and suicidal ideation (APA, 2013). Comorbidity between GAD and MDE and/Major Depressive Disorder (MDD) is pervasive (Blanco et al., 2014) and associated with physical and psychological outcomes such as worsened sleep and perceived quality of life (Zhou et al., 2017), as well as functional impairment (ter Meulen et al., 2021).

Both GAD and MDE are associated with opioid use (Martins et al., 2012); around a third of MOUD receiving individuals screen positive for current depression and anxiety, respectively (self-report; Hooker et al., 2020). Further, the association between MDE, GAD, and OUD appears to be bi-directional, such that individuals using opioids are likely to have a history of depression and anxiety disorder symptoms, and opioid use predicts subsequent depression and anxiety disorder symptoms (Martins et al., 2012). Estimates suggest that half of all opioid prescriptions are written on behalf of individuals with symptoms of depression or anxiety (Davis et al., 2017). These associations are stronger among justice involved groups, for example, Shaffer et al. (2020) noted that 74 and 68.5 percent of their primarily opioid using sample screened positively for anxiety and depression, respectively (self-report).

Transdiagnostic Treatment

Although categorical classification may efficiently facilitate the matching of a specific diagnosis with evidence-based protocols, this approach may mask co-morbidities and nuances in both treatment and assessment, the latter of which, when continuous, is associated with increased diagnostic reliability and validity (Markon et al., 2011). A focus on dimensionality and symptom level associations across areas of mental health disorders is complemented by the employment of interventions with a transdiagnostic focus, that is, interventions which target symptoms (e.g., emotion regulation) across mental health disorders like anxiety and depression (Sloan et al., 2017).

For example, the Unified Protocol for Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al., 2017; Cassiello-Robbins et al., 2020) was developed to treat both mood (e.g., MDE) and anxiety (e.g., GAD) disorders, citing shared, dimensional

factors across pathology. These include emotion regulation, avoidance, cognitive distortions, and behavioral exposures. A benefit to this protocol is its modular basis; thematic, transdiagnostic concepts are introduced in enclosed modules, which can be re-ordered or presented independently of others (Ellard et al., 2012).

Transdiagnostic approaches such as the UP have been suggested to have a high public health impact, being particularly advantageous in low-resource settings (e.g., among marginalized groups) due to their flexible and “multi-problem” nature (Martin et al., 2018). Individuals who are incarcerated for short periods may benefit from modules targeting symptoms or behaviors with greater impairment prior to release. Indeed, when examined among individuals with a variety of anxiety disorders, against disorder specific evidence-based treatments, treatment via the UP demonstrated similar symptom reduction with less attrition (Barlow, et al., 2017), a significant concern among justice involved groups receiving mental health treatment (Johnson & Zlotnick, 2012).

Transdiagnostic treatments may contribute to outcomes such as reductions in substance use, symptoms of mental health, and risk for recidivism among justice involved groups. Therapies delivered among justice involved groups with multiple diagnoses in mind, such as MISSION-CJ (e.g., Shaffer et al., 2020) have resulted in decreased heroin use and rates of reincarceration, as well as improvements in other psychosocial factors associated with risk, such as housing and employment. However, programs like MISSION-CJ encompasses a variety of interventions in addition to mental health counseling, complicating the identification of mechanisms and evidence for targeted co-occurring disorder treatments. Transdiagnostic treatments with a SUD and co-occurring disorder focus may more efficiently reduce risk and negative behavioral outcomes associated with

SUD among justice involved groups. Preliminary investigations of the Unified Protocol among substance using adults in the community, for example, have noted reductions in both depression symptoms and alcohol use (see Cassiello-Robbins et al., 2020).

Methodological Considerations

Although targeted, transdiagnostic treatments have potential to benefit those who are justice involved and experiencing SUD, little guidance exists to shape such protocols. Anxiety and depression, two categories of mental health disorders which occur disproportionately among justice involved individuals and those with OUD (Butler et al., 2011; Robertson et al., 2018; Shaffer et al., 2020), are key targets for treatment. An important step towards informing future treatment is to better assess and describe co-occurring disorders among those with OUD, particularly those with a history of justice involvement. In particular, applying a dimensional, symptom-focused approach to the examination of associations among co-occurring disorders, SUD, and justice involvement may better illustrate the importance of transdiagnostic treatment, encouraging the use of integrated treatment programs rather than siloed mental health and substance use intervention. Additionally, the examination of depression and anxiety symptoms in tandem, rather than in isolation, may more accurately represent their association with OUD (Rogers et al., 2021).

Summary and Aims

Justice involved individuals in the U.S. have a high likelihood of experiencing opioid use and co-occurring mental health disorders, such as anxiety and depression (Butler et al., 2011). Given the role of substance use in extant models of risk (Andrews et al., 2006), the significant relationship between OUD and justice involvement (Winkelman et al.,

2018), and the influence of co-occurring disorders on risk and other behavioral outcomes (Skeem et al., 2014), treatment of such co-occurring disorders stands to combat risk for recidivism, in addition to symptoms of OUD and other behavioral outcomes.

Extant work highlights the co-occurrence of depression and anxiety symptoms (Beard et al., 2016). Evidence for the efficacy of transdiagnostic treatments is strong among justice involved (Chandler & Spicer, 2006) and substance using groups (Cassello-Robbins et al., 2020). Taken together, it can be inferred that the application of transdiagnostic treatments targeting anxiety and depression among justice involved, opioid using groups may yield reductions in legal (e.g., recidivism) and behavioral (e.g., substance use, conduct) outcomes (Skeem et al., 2014).

Thus, the present study seeks to provide direction in order to better meet the needs of justice-involved individuals with OUD and co-occurring disorders by describing depression and anxiety symptoms, as well as their association, among individuals with OUD and a history of justice involvement. The aims of this study are as follows.

Aim 1: To describe the associations among justice involvement, SUD severity, and symptoms of co-occurring disorders.

Hypothesis 1: The presence of an anxiety or depressive disorder will be associated with having a SUD diagnosis.

Hypothesis 2: This association will be stronger among those with a greater history of justice involvement

Aim 2: To examine differences in the association between depression and anxiety symptoms and OUD severity, in addition to SUD.

Hypothesis 3: Depression and anxiety symptoms will be associated with OUD severity.

Hypothesis 4: Justice involvement will moderate the association between depression and anxiety symptoms and OUD severity.

Because few previous studies have examined justice involved groups regarding symptom-based associations, additional findings will be considered exploratory.

CHAPTER 2: METHOD

This study used data from a larger, IRB approved, multi-site study examining the prevalence and validity of co-occurring mental health and opioid use disorder among individuals receiving substance use treatment.

Participants

Participants included 50 individuals (54% Male; M age = 39.3, SD = 10.9), recruited from various inpatient and outpatient substance use treatment centers in the northeastern United States. Recruitment consisted of the provision of a flyer describing the study to directors of these treatment centers, on which contact information is listed. Participants were instructed to call a study phone number, during which a phone screen occurred. Participants were 68% White, 14% Black, 12% Mixed-Race, 2% Asian, and 2% Native/Pacific Islander (2% did not report). 14% of participants identified as Hispanic or Latino.

Procedure

Participants were pre-screened for acute psychosis, mania, and other conditions that may affect the validity of consent or diagnostic interviews; they then participated in a screening call during which the study was reviewed. Consent was distributed online, signed digitally, and reviewed during the interview, which took place over videoconference. After providing self-reported demographic information including race, gender, age, ethnicity, and education level, participants completed the diagnostic interviews detailed below. Following completion of the interview, participants were compensated with a digital \$50.00 gift card to amazon.com.

Depression and anxiety symptoms: Structured Clinical Interview for DSM-5, Research Version (SCID-5 RV)

The SCID-5-RV (First, et al., 2015) is a comprehensive, semi-structured diagnostic interview used to assess DSM-5 mental and substance use disorder criteria (APA, 2013; First et al., 2015). Like the DSM-5, the SCID-5-RV is divided into sections according to categories of mental disorder (e.g., Generalized Anxiety Disorder). Questions or prompts corresponding to each criterion for mental and substance use disorders are provided, e.g., “Have you had to give up or reduce the time you spent at work or school, with family or friends, or on your hobbies because you were using (opioids) instead?” (First, et al., 2015). Interviewers can elaborate on questions, clarify material, and probe for additional information to thoroughly supplement standard inquiries (Shankman, et al., 2018). Mental illness criteria are marked as being absent/false (1), subthreshold (2), or true (3); yielding totals determined to be consistent or inconsistent with DSM-5 diagnosis.

As the latest iteration in a series of similar DSM based assessments, data on reliability and validity of the SCID-5-RV is limited. However, previous versions, as well as a nearly identical clinical version demonstrate good reliability and validity (Osório, et al., 2019; Lobbestael, et al., 2011; Zanarini, et al., 2000). The current study uses the NetSCID, a digital version of the SCID-5 RV. The NetSCID, in addition to being validated, is associated with less data-entry and fewer branching errors than the paper-based SCID (Brodey et al., 2016).

Self-Reported History of Justice Involvement

History of arrest and incarceration was assessed through the SCID-5, following the question, “Have you ever been arrested or involved in any legal trouble?” Positive

responses are followed by assessment of the self-reported date and type of arrest(s), which are recorded on the “Life Chart” section of the SCID-5. Similar to the style of a “Life Events Calendar”, a measure in which a person recalls relevant life events and enters them into a calendar format (Roberts & Horney, 2010), interviewers encouraged participants to label important dates in their life (e.g., birthdays, deaths, milestones) to facilitate recall. While we did not include official records of arrest and incarceration, similar self-report methods of collection elicit valid recall of arrest history, regardless of current substance use (Morris & Slocum, 2010). Indeed, self-report is a valid method of obtaining arrest history from psychiatric populations (Nieves et al., 2000), and yields results consistent with those of administrative record reviews (Lemieux et al., 2017).

Data Analytic Plan

Study analyses were conducted using the processR package in R (R Core Team, 2020). To examine the influence of justice involvement on the association between depression and anxiety symptoms and OUD, three models will be examined. These models are depicted in Figure 1, 2, and 3.

Beginning with a categorical perspective, anxiety and depression diagnoses will be examined as a predictor of SUD diagnoses. Specifically, the presence or absence of anxiety or depressive disorders will be coded as 0 (none) and 1 (any). To represent differences related to justice involvement, arrest history (number of previous arrests) will be incorporated as a moderator of this association.

Models 2 and 3 will incorporate anxiety and depression symptoms, rather than broad diagnoses, as such those who did not meet criteria for full diagnoses will be represented by way of number of symptoms endorsed. Finally, in Model 3, the association

between such symptoms and severity of OUD, as affected by arrest history, will be examined.

CHAPTER 3: RESULTS

All analyses were conducted using R (R Core Team, 2020). Participants who did not complete the interview (e.g., due to scheduling issues or ceasing to contact researchers) were excluded from analyses ($n = 2$). Because of the current study's focus on mood and anxiety disorders, we incorporated the most frequently occurring mood and anxiety disorders into analyses; these included (n ; %) Major Depressive Episode (MDE; 3; 6%), Persistent Depressive Disorder (PDD; 8; 16%), Generalized Anxiety Disorder (GAD; 10; 20%), and Social Anxiety Disorder (SAD; 5; 10%). 100% of participants met criteria for at least one SUD, and 82% had more than one SUD. 42% of participants met criteria for Opioid Use Disorder, with 95.23% of those endorsing symptoms consistent with "severe" OUD.

Correlations and descriptive statistics of study variables are available in Tables 1 and 2. Because our analyses entailed examination of both co-occurring disorders as diagnoses and symptoms, Table 1 incorporates each diagnosis. The presence of a diagnosis reflects diagnostic criteria being met according to the DSM-5. The presence of an MDE diagnosis was correlated with PDD, $r = .35$; SAD and GAD were similarly correlated, $r = .33$. Age was correlated with arrest, $r = .37$, such that older participants were more likely to have an increased number of arrests. Interestingly, SUD and poly-SUD were not significantly correlated with other variables, including arrest. Because the vast majority of participants met criteria for "severe" OUD (all but one), we examined OUD as a dichotomous variable rather than as a metric of severity.

Table 2 includes anxiety and mood symptoms as totals reflecting number of symptoms endorsed; participants who were screened out of sections (e.g., MDE), were

coded as having zero symptoms for that particular disorder. Table 3 details the number of participants who endorsed each symptom. The number of participants who endorsed any symptom of MDE ($n = 24$), PDD ($n = 21$), GAD ($n = 18$), and SAD ($n = 20$) was higher than those who endorsed the full spectrum of necessary criteria to warrant a diagnosis of each disorder. Total number of anxiety symptoms and depression symptoms were correlated, $r = .48$. Anxiety ($r = .40$), but not depression ($r = .19$) symptoms were correlated with gender, such that female participants were more likely to endorse symptoms of anxiety.

Of note, certain symptoms or behaviors are reflected in both PDD and MDE, for example, fatigue is present as a symptom of either disorder (see Appendix A and B). Further, MDE and PDD symptoms were significantly correlated in this sample ($r = .35$), thus we examined where participants were endorsing duplicate symptoms. We identified the following numbers of participants endorsing six thematically similar symptoms: depressed mood (12), appetite changes (6), sleep (6), fatigue (9), diminished cognition (7). Participants with both MDE and PDD symptoms in these categories had their respective MDE symptoms re-coded to 0 to reduce collinearity as a result of duplicate symptoms.

Main study analyses were conducted using PROCESS for R version 4.1 (see Hayes, 2022). Continuous variables (arrest history, total number of depression and anxiety symptoms) were mean centered during analysis; bootstrapping was employed. Results of these analysis are available in Table 4.

Model 1

Model 1 examined the associations among arrest history, COD diagnoses, and SUD diagnoses, by testing arrest history as a moderator of the association between COD

diagnoses and SUD diagnoses. COD diagnoses were entered as 0 (none) or 1 (at least one). Any current SUD was entered as 0 (none), 1 (one), or 2 (more than one). Contrary to hypotheses, neither the presence of a co-occurring disorder, arrest history, nor the interaction between was significantly associated with increased SUD.

Model 2

Model 2 tested arrest history as a moderator of the association between anxiety and mood symptoms, rather than diagnoses, and the presence of current SUD. A variable representing total number of symptoms of MDE, PDD, GAD, and SAD was created to reflect COD symptoms. Consistent with Model 1, arrest history was not associated with SUD incidence; neither mood and anxiety symptoms nor the interaction between them and arrest history was associated with SUD incidence.

Model 3

Model 3 tested arrest history as a moderator of the association between mood and anxiety symptoms and OUD, specifically. Consistent with DSM-5 guidelines, OUD severity was originally operationalized as 0 (none), 1 (mild), 2 (moderate), and 3 (severe). Due to the distribution of OUD severity in our sample, this variable was revised to represent the presence or absence of an OUD diagnosis (i.e., as a binary variable). Again, depression and anxiety symptoms were not associated with OUD. Neither arrest nor the interaction between arrest and depression/anxiety symptoms were significantly associated with OUD.

Our sample was underpowered for both linear regression and logistic regression, the latter of which was implemented due to the dichotomous nature of our dependent variables, SUD and OUD. Power analyses were run using G*Power (Faul et al., 2009), and suggested that a minimum sample size of 77 would be required to detect a medium effect

size with 3 predictors in a linear regression analysis. Power analyses for logistic regression suggested that a larger odds ratio and a sample size over twice as large would be necessary to detect an effect.

CHAPTER 4: DISCUSSION

We examined the associations among arrest history, substance use, and anxiety and depression symptoms among a mixed-gender, treatment-receiving sample of adults. To investigate differential relationships according to both diagnostic criteria and symptom frequency, we characterized the sample by both diagnosis of GAD, SAD, MDE, and PDD, as well as number of symptoms across these disorders.

Model 1 and 2

In Model 1, we anticipated that the presence of a co-occurring disorder would be associated with greater incidence of substance and poly-substance use, and that this relationship would be moderated by justice involvement (i.e., a history of arrest). Contrary to hypotheses, neither the association between COD and SUD nor the effect of arrest history were significant.

Like Model 1, Model 2 employed arrest history as a moderator, but of the association between COD symptoms, rather than diagnoses, and SUD incidence. The direct association between symptoms and SUD severity was neither significant nor moderated by arrest history.

The finding that co-occurring disorders were not associated with increased SUD was inconsistent with previous work. Given the frequency and severity of co-occurring disorders among justice involved populations across areas of justice involvement (i.e., in prison, Al-Rousan et al., 2017; on probation/parole, Cloyes et al., 2010; in jail, Zaller et al., 2019), as well as the disproportionate incidence of SUD among justice involved populations (Peters et al., 2004), we also did not anticipate that this association would not be moderated by arrest history.

A possible explanation for nonsignificant effects among variations of COD and SUD in Models 1 and 2 is the nature of our sample, such that individuals were recruited from one residential and three outpatient SUD treatment centers. Results may differ among those who aren't currently involved in SUD and COD treatment, such as incarcerated individuals who lack access to treatment programs (SAMHSA, 2020), or those referred to treatment programs from carceral or forensic settings (Krawczyk et al., 2017).

Model 3

In our final model, we examined symptoms of anxiety and depression as predictors of OUD. Once again, the independent associations between symptoms, arrest, and OUD were not significant, and neither was the effect of the interaction between symptoms and arrest. This finding was unexpected, following previous documentation of the significant association between OUD and justice involvement (Winkelman et al., 2018). Given the particularly strong relationship between *heroin* use and justice involvement, it was additionally surprising that this association emerged in our sample, among whom heroin use (n = 16) was endorsed more frequently than use of prescription opioids (n = 6).

Like our first two models, the results of Model 3 may be a product of using a treatment-receiving sample, among whom current SUD and COD symptoms may be mitigated. Indeed, 80% of individuals diagnosed with OUD in this sample were currently on maintenance medication, the sole evidence-based treatment for OUD (Connery, 2015). Interestingly, the majority of those with OUD still endorsed “severe” OUD, such that they endorsed the majority of OUD criteria. However, this severity level could reflect symptoms of OUD occurring at any point in the past 12-months, rather than COD symptoms of – for example – MDE, which, for a current diagnosis, must occur within the past month.

Further, the frequency of OUD in this sample, as well as the limited variability within OUD Severity further restrict inferences from the results of Model 3. Indeed, taken together with consistent previous evidence supporting a strong association between co-occurring disorders and OUD among community and justice involved groups (Jones & McCance-Katz, 2019; Rogers et al., 2021; Rosic et al., 2017), it is possible that this effect is an artifact of limited statistical power, particularly given the results of our power analyses, which suggest that our sample was underpowered for both the originally planned regression (linear) and the logistic regressions implemented to account for dichotomous dependent variables (SUD and OUD). A larger sample size could entail individuals with mild, moderate, and severe OUD, allowing for more nuanced examinations of factors which exacerbate OUD symptoms. Further, a larger sample size may have resulted in a significant effect of arrest on OUD, given this the confidence intervals of this particular finding and previous documentation of such an association.

An additional contributor to our findings may also be how justice involvement was operationalized. While self-reported incidence of arrest is a valid method with which to ascertain arrest history from psychiatric populations with a history of substance use (Lemieux et al., 2017; Morris & Slocum, 2010; Nieves et al., 2000), justice involvement comprises more than arrests alone. Results may differ if this construct were expanded to incorporate factors related to incarceration, such as time since re-entry, during which individuals are particularly vulnerable to SUD and associated risks like overdose, which is particularly frequent among those with OUD (Binswanger et al., 2013; Joudrey et al., 2019).

Implications

Despite results inconsistent with hypotheses and previous literature, implications may be drawn in the following areas.

Assessment

In their meta-analysis comparing discrete and continuous measures of psychopathology, Markon et al., (2011) highlight the “loss of information” which may occur when a construct is discretized, or demarcated with categorical cutoffs. Consistent with this theme, the difference between the number of individuals who endorsed criteria sufficient to warrant a full diagnosis and those who endorsed subthreshold symptoms within our sample suggests that a focus on DSM diagnoses may obfuscate those who do not meet criteria for certain disorders. For example, the number of individuals who met criteria for current MDE was three, compared to 24 individuals endorsing any MDE symptom. The frequency of such subthreshold symptoms may have clinically significant effects on distress, vulnerability, and impaired functioning among populations with SUD and/or justice involvement.

In their investigation of subthreshold psychiatric symptoms among those in a large national sample, Johnson et al. (2022) found that both Alcohol Use Disorder and SUD were significantly associated with subthreshold psychiatric symptoms across a variety of disorders including mood and anxiety. In some cases, subthreshold symptoms were associated with AUD and SUD where entire diagnoses were not (e.g., Social Anxiety), underscoring the importance of examining symptom level associations with SUD outcomes. Indeed, more comprehensive assessment of such symptoms appears to be needed among those with SUD, given the relative dearth of treatment and assessment

among those with SUD (e.g., Priester et al., 2016). That lack of access to treatment and assessment is prevalent among justice involved individuals suggests that those in correctional settings may be further impaired by subthreshold symptoms.

Intervention

While co-occurring disorder diagnoses were not associated with increased incidence of SUD, OUD Severity, or Arrest, 20% of our sample had at least one COD, and 18% endorsed the presence of more than one COD. Given the frequency documented by Johnson et al. (2022), it follows that transdiagnostic, subthreshold symptoms are also prevalent among populations with SUD. As discussed, models such as the Unified Protocol are well suited to address transdiagnostic symptoms and themes in a time-limited manner (Martin et al., 2018). In particular, cognitive behavioral treatments like cognitive-restructuring and functional analysis may target the more frequently occurring symptoms in this sample, such as those pertaining to negative self-evaluation (e.g., feelings of guilt, poor self-esteem, fear of judgement from others).

Capitalizing on specific patterns of symptoms unique to justice involved groups with OUD will make best use of the limited period during which they may be in contact with treatment providers. An example of a time-limited, evidence-based practice with potential among this group is Motivational Interviewing (MI; Miller & Rollnick, 2012), a reflective conversational style used to elicit change talk among clients. MI, implemented as briefly as four-hours on average, has been associated with reduced risk of recidivism (Anstiss et al., 2011). Well studied among substance-using, justice involved groups (McMurrin, 2009), MI is also associated with treatment retention (Yang et al., 2019). MI can be paired with other psychosocial interventions (e.g., Cognitive Behavioral Therapy)

to bolster treatment attendance and motivation (McKee et al., 2007) and reduce substance use (Kikkert et al., 2018).

Justice Involvement

Given our nonsignificant findings, the impact of justice involvement on mental health symptoms is called into question. Our inference of this result is limited by not assessing for other components of justice involvement, such as history of incarceration or severity and type of arrest, as well as having a participant pool of community (rather than incarcerated) residents. Despite this result, previous work has consistently demonstrated a link between justice involvement and elevated rates of both mental health disorders and substance use disorders. The proportion of participants with an arrest history in our sample (72%) is further evidence of that link, supporting the notion that individuals with substance use disorders may be more likely to have a history of justice involvement.

Evidence supports tailoring substance use treatment to meet the needs of vulnerable groups, such as trauma-informed (e.g., Covington et al., 2008) or gender-informed treatment (Grella, 2008; Messina et al., 2010). Such programs reflect the nuances of a history which may exacerbate symptoms of use. A history of arrest, and consequently incarceration, merits such considerations in treatment. In addition to the pressing risk factors associated with time following incarceration (e.g., overdose & death, Binswanger et al., 2013; Joudrey et al., 2019; treatment dropout, Zlotnick et al., 2009), the nature of contact with the justice system imposes disadvantages on affected individuals.

Such factors include additional responsibilities assigned to those with a record of offenses. For example, conditions of parole are more likely to be violated by those with mental health disorders (Cloyes et al., 2010), increasing the likelihood of further

disruptions to community-based treatment. Such restrictions may also affect relevant social stressors such as housing, employment, and social support networks. It can be inferred from the lack of evidence-based treatment options in correctional settings that those with a history of justice involvement have experienced continual periods with minimal – if any – treatment (The National Center on Addiction and Substance Abuse, *Behind Bars*, 2010), and it appears referrals from the justice system are often unsuccessful in facilitating hand-off to community-based treatment options (Nunn et al., 2009).

In addition to underscoring the need for time limited treatments, this frequency of transitions suggests that effective treatment would involve a focus on building and sustaining motivation, as well as bolstering skills like advocacy and identifying treatment resources across the community and justice settings (e.g., making a plan for re-entry in the community or identifying providers in a correctional setting). Systemically, models such as the Vermont hub-and-spoke, which integrates networks of treatment providers within communities and facilitates referrals across provider type (Brooklyn & Sigmon, 2017), may be particularly impactful among the justice involved. The incorporation of such mental-health adjacent constructs in treatment speaks to the RNR model, and the numerous psychosocial factors which increase a person’s likelihood of returning to a correctional setting.

Compounding such structural factors is the stigma associated with both substance use and justice involvement. Hartwell (2004) outlined the “triple stigma” faced by those with SUD, co-occurring disorders, and justice involvement, noting its association with homelessness, recidivism, and a lack of social support in the community. Indeed, justice involved individuals with SUD appear to struggle with self-stigmatization, which hampers

treatment engagement and overall self-esteem (Newman & Crowell, 2021). The frequency of such stigma speaks to the importance of individual and systemic reform in treatment of individuals with SUD and a history of justice involvement (e.g., use of stigmatizing language, Dunn & Andrews, 2015).

Finally, the intersection of the justice system and systemic oppression, specifically racism, harms those involved. The factors outlined above are affecting Black and Hispanic individuals at a vastly disproportionate rate. In particular, the cultural response to crime and substance use in the United States (e.g., the War on Drugs, Provine, 2011) has fostered racial inequity with substantial downstream effects such as poverty and mass disenfranchisement (Miller & Spillane, 2012). These issues emphasize the importance of culturally-responsive, justice-informed care among those with a history of justice involvement.

Limitations

Strengths of this study include a relatively diverse, mixed-gender sample recruited from a mix of residential and outpatient settings, due in part to the use of telehealth in reaching a broader pool of participants. However, this study is decisively limited by its sample size. Indeed, while the variety of SUD diagnoses reflected in this sample is representative of the community and justice settings, the number of individuals with OUD was limited. Given a larger number of individuals with OUD, differential relationships more consistent with previous work may have been identified in the data. Sample size limitations speak to the challenges of recruitment via community based treatment centers, particularly when in-person visits are infeasible due to restrictions imposed by the COVID-19 pandemic.

Future studies involving such treatment populations may benefit from continued use of appropriate incentives to participate and prioritizing convenience for participation (Brintnall-Karabelas et al., 2011). Researchers may also benefit from familiarization of barriers among treatment providers in outpatient and residential treatment settings, such as discomfort introducing conversations about research participation, accessing required technology, clarifying secondary gains, and ensuring boundaries between participation in research and treatment (e.g., Mason et al., 2007).

The validity of diagnoses and symptoms in the present study is bolstered by the use of semi-structured, comprehensive clinical assessment (e.g., Stuart et al., 2014), particularly a digital version which has added benefits (e.g., entry errors; Brodey et al., 2016). Despite these strengths, this study is further limited by the nature of an assessment like the SCID-5, which employs the use of a set of screeners to guide use of interview sections. By employing such screeners, individuals who might potentially endorse symptoms when asked do not get the chance to do so. Consequently, to truly assess a broad spectrum of transdiagnostic symptoms among individuals, interview questions would ideally be identical across participants. A future study could abstain from the use of screeners, but also focus on the most common co-occurring disorders among substance using and justice involved populations to maintain efficiency in data collection.

Finally, given the cross-sectional nature of our data, we are limited in drawing conclusions about causality or chronology. However, determining causality may be less imperative among justice involved groups with COD. Evidence suggests that those experiencing COD benefit from simultaneous or integrated, rather than sequential, treatment of both SUD and COD (McKee et al., 2007; Schumm & Gore, 2016; Taxman et

al., 2008). Similarly, previous work suggests that symptoms of SUD and CODs exacerbate each other. For example, Rogers et al. (2021) labeled mood, anxiety, and OUD symptoms as “reciprocal and dynamic”, such that the authors identified a bi-directional relationship between either symptom group in a review of several studies. At the point of justice involvement, during which access to treatment is greatly limited, a focus on implementation of effective, integrated, and time-limited treatments rather than causality alone may further benefit those who are justice-involved.

Future Directions

Given the findings of the current work, an important next step in this line of research is addressing the limitations of sample size, conceptualization of justice involvement, and thoroughness of assessment. Primarily, a larger sample size of participants who complete identical assessments without pre-screening criteria may provide the most accurate representation of ongoing mental health and SUD symptoms. Further, a sample involving individuals with variable degrees of justice involvement (i.e., incarcerated, under community supervision, history of arrest/incarceration, no history) could better illustrate differences across the spectrum of justice involvement. Research looking to further understand the bi-directional nature of COD and SUD symptoms might also employ ecological momentary assessment (EMA) which involves the use of more frequent assessment (e.g., daily questionnaires via a smartphone app) to understand symptoms experienced in real time (Fatseas et al., 2018).

Additional Methodological Considerations

In addition to the employment of comprehensive, symptom focused assessment, alternative statistical approaches may further illuminate associations across disorders on a

symptom level. One such analytical strategy is network analysis, the use of statistical “networks” to represent variables (i.e., nodes) and their relationships with each other (i.e., edges; Borsboom & Cramer, 2013). Network Analysis offers a compelling, web-like visual organization of nodes, such as symptoms of mental illness or substance use, and depicts the relative strength and direction of edges (e.g., correlations) between them (Hevey, 2018), yielding valuable information about the interplay among variables, which basic regressions or correlations may obscure. The use of networks in psychopathology research is predicated on the notion that mental illnesses do not exist independently of their symptoms, and that direct, potentially causal relationships exist between symptoms, (e.g., arousal and avoidance; Borsboom & Cramer, 2013), which contribute to shared impairment and comorbidity among disorders (Cramer et al., 2010). Such causal networks are thematically similar to the bi-directional nature of COD and SUD and OUD symptoms.

For example, Rhemtulla et al. (2016) applied a network framework to a large sample of adults who endorsed symptoms of various substance use disorders, the diagnostic criteria of which are identical across classes of drugs (APA, 2013). In addition to a network model of substance use symptoms across drug class, they ran models for each individual drug class, yielding differential patterns and strength of associations among nodes. Notably, symptoms of OUD were distinguished from those of cannabis and stimulants by stronger associations among tolerance (D1), withdrawal (D2), time spent engaging in use (D5), and engagement in use over spending time with family and friends, at work, or doing hobbies (D6), a criterion that is conceptually similar to both the family/marital relationships and prosocial recreational activities risk/needs in the RNR model (Bonta & Andrews, 2007).

Of further utility in network analysis is the distinction between more *central* and *peripheral* nodes, which differ in their strength and number of connections (edges) and can represent the clinical relevance of certain symptoms. Notably, a node being more central implies that intervention in this area would contribute to mitigation of other connected symptoms (Blanken et al., 2019; Elliott et al., 2020; Fried et al., 2015; Valente, 2012). Additionally, the extent to which certain nodes within a network hang together as *clusters* or *communities* adds depth to understanding of how specific symptoms amass independently of and across the categorical classification of mental illnesses (Fried, 2016; Borsboom & Cramer, 2013).

Networks have expanded to examine both GAD and MDE symptoms, in addition to SUD. Similar to previous work (Wigman et al., 2017), Beard et al. (2016) found more connections within, rather than between, GAD and MDE in a psychiatric sample. However, the authors identified strong connections between the two domains, such as an association between excessive worry and guilt, as well as between sad mood and nervousness. Sad mood and excessive worry were the most central within the combined MDE and GAD network, which is unsurprising given their conceptual importance in MDE and GAD phenotypes.

Examining mood and anxiety disorders in a symptom network, (Lutz et al., 2018) found that denser connections (i.e., a greater number of edges among symptoms) were associated with treatment dropout, suggesting potential differences in motivation or impairment. Indeed, denser network connections may speak to the notion of a causal system, in which symptoms self-perpetuate and worsen (e.g., Beard et al., 2016), a possibility among those with OUD, which can both precipitate and follow symptoms of

MDE and GAD (Martins et al., 2012). Such differences in MDE and GAD severity and strength of connection may also be associated with justice involvement, a characteristic associated with greater incidence and severity of co-occurring disorders (Fazel et al., 2017; Fazel & Seewald, 2012). Specifically, such an approach could be used to test the effect of such influential symptom clusters rather than simply using symptom counts. That is, particular symptoms and groupings of symptoms may influence distress and impairment where symptom counts, whether above or below diagnostic thresholds, may be insufficiently sensitive in detecting important patterns of vulnerability.

Conclusion

Given limitations of power, sample size, and variability in OUD, no significant effects were detected in the associations among these variables. Taken together with the frequency of COD and arrest in our sample, previous work maintains the disproportionate incidence of SUD and COD among justice involved individuals. Work seeking to support intervention among this vulnerable group would benefit from symptom-focused assessment informing transdiagnostic treatment, with care paid to the numerous factors placing justice involved individuals at risk for harmful legal and mental health outcomes.

Table 1. Means, standard deviations, and correlations of diagnosis variables with confidence intervals

Variable	<i>M</i> (n)	<i>SD</i>	1	2	3	4	5	6	7	8
1. Arrests	4.82	7.18								
2. Gender	0.54	0.50	-.11							
			[-.38, .18]							
3. Age	39.30	10.93	.37**	.02						
			[-.10, .59]	[-.26, .30]						
4. MDE	0.06 (3)	0.24	-.06	.23	-.08					
			[-.34, .22]	[-.05, .48]	[-.35, .20]					
5. PDD	0.16 (8)	0.37	.10	.18	.10	.35*				
			[-.18, .37]	[-.10, .44]	[-.18, .37]	[.08, .57]				
6. GAD	0.20 (10)	0.40	.10	.06	-.09	.08	.05			
			[-.18, .37]	[-.22, .33]	[-.36, .20]	[-.20, .35]	[-.23, .33]			
7. SAD	0.10 (5)	0.30	-.17	.31*	-.11	.20	.04	.33*		
			[-.43, .11]	[.03, .54]	[-.37, .18]	[-.09, .45]	[-.24, .31]	[.06, .56]		
8. COD	0.38 (19)	0.49	.04	.23	-.03	.32*	.56**	.64**	.43**	
			[-.24, .32]	[-.06, .47]	[-.31, .25]	[.05, .55]	[.33, .72]	[.44, .78]	[.17, .63]	
9. SUD	1.82 (9; 41)	0.39	.16	.09	-.11	.12	.06	.10	.16	.15
			[-.13, .42]	[-.19, .36]	[-.37, .18]	[-.17, .38]	[-.22, .34]	[-.18, .37]	[-.13, .42]	[-.13, .41]

Note. MDE = Major Depressive Episode. PDD = Persistent Depressive Disorder. GAD = Generalized Anxiety Disorder. SAD = Social Anxiety Disorder. COD = Co-occurring disorder. SUD = Substance Use Disorder. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. * indicates $p < .05$. ** indicates $p < .01$. Because disorder variables were binary, number of individuals with those disorders are noted in parentheses. For SUD, 9 individuals had one SUD, and 41 had more than one.

Table 2. Means, standard deviations, and correlations of symptom variables with confidence intervals

Variable	M (n)	SD	1	2	3	4	5	6
1. Arrests	4.82	7.18						
2. Gender	0.54	0.50	-.11 [-.38, .18]					
3. Anxiety Symptoms	4.22	4.51	-.03 [-.31, .25]	.40** [.13, .61]				
4. Depression Symptoms	4.60	4.25	.05 [-.24, .32]	.19 [-.09, .44]	.48** [.23, .67]			
5. Depression/ Anxiety Symptoms	8.82	7.53	.01 [-.27, .29]	.34* [.07, .57]	.87** [.78, .92]	.85** [.75, .91]		
6. OUD	0.40 (20)	0.49	.18 [-.11, .43]	.10 [-.19, .37]	.12 [-.17, .38]	-.04 [-.31, .24]	.05 [-.23, .32]	
7. SUD	1.82 (9; 41)	0.39	.16 [-.13, .42]	.09 [-.19, .36]	.09 [-.19, .36]	-.13 [-.40, .15]	-.02 [-.30, .26]	.38** [.12, .60]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. * indicates $p < .05$. ** indicates $p < .01$. Because the OUD variable is binary, number of individuals with those disorders are noted in parentheses. For SUD, 9 individuals had one SUD, and 41 had more than one.

Table 3. Frequencies of Endorsed Symptoms

Criterion	Symptoms	n
MDD		
A1	Depressed mood	8
A2	Diminished interest/pleasure	15
A3	Weight or appetite	11
	Weight loss or decreased appetite	9
	Weight gain or increased appetite	3
A4	Sleep problems	10
	Insomnia	7
	Hypersomnia	5
A5	Psychomotor agitation or retardation	23
	Psychomotor agitation	20
	Psychomotor retardation	12
A6	Fatigue or loss of energy	8
A7	Worthlessness or guilt	17
	Worthlessness	13
	Inappropriate guilt	15
A8	Diminished cognition	9
A9	Thoughts of own death or suicide	4
	Thoughts of own death	6
	Suicidal ideation	2
	Specific plan	0
PDD		
A	Depressed mood for at least 2 years (1 for adolescents)	19
B1	Poor appetite or overeating	12
B2	Insomnia or hypersomnia	13
B3	Low energy or fatigue	16
B4	Low self-esteem	18
B5	Poor concentration or difficulty making decisions	12
B6	Feelings of hopelessness	16
GAD		
A	Excessive Anxiety	16
B	Lack of control	16
C1	Restlessness	16
C2	Easily fatigued	13
C3	Difficulty concentrating	15
C4	Irritability	16
C5	Muscle tension	15
C6	Sleep disturbance	14
SAD		
A	Marked fear of social situations	18
B	Fear of negative evaluation	18
C	Consistently anxiety provoking	14
D	Social situations endured with intense anxiety	14
E	Fear out of proportion	13
F	Persistent fear	13

Table 4. Results of Study Models

	Coeff	SE	t	<i>p</i>	LLCI	ULCI
Model 1 (SUD)						
COD	0.48	1.03	0.47	0.6394	-1.54	2.51
Arrest	0.21	0.19	1.14	0.2537	-0.16	0.59
CODxArrest	-0.21	0.22	-0.96	0.3387	-0.63	0.22
Model 2 (SUD)						
Anx/Mood	-0.03	0.07	-0.53	0.5985	-0.16	0.09
Arrest	0.14	0.13	1.15	0.2522	-0.10	0.39
Anx/MoodxArrest	-0.01	0.02	-0.81	0.4196	-0.04	0.02
Model 3 (OUD Severity)						
Anx/Mood	0.01	0.04	0.26	0.7972	-0.07	0.09
Arrest	0.11	0.06	1.84	0.0651	-0.01	0.23
Anx/MoodxArrest	-0.05	0.04	-1.27	0.2032	-0.12	0.03

Figure 1. Proposed Model 1

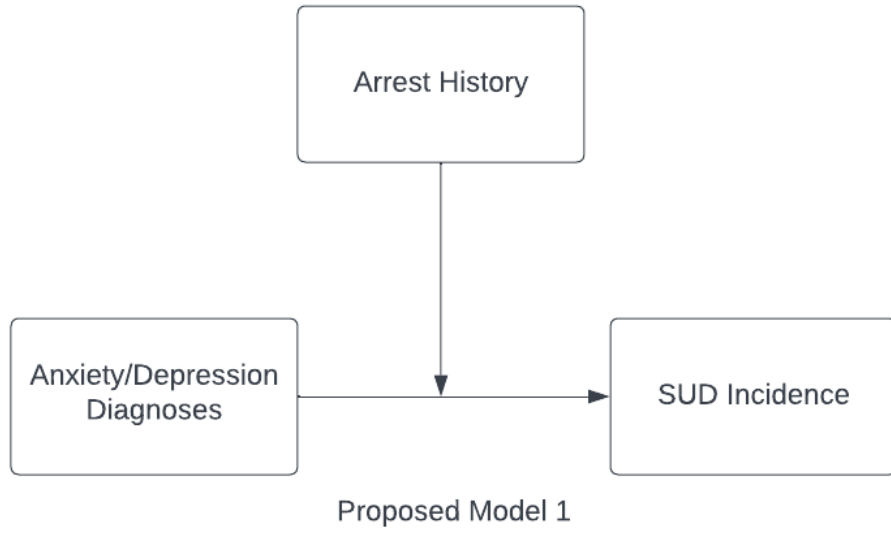
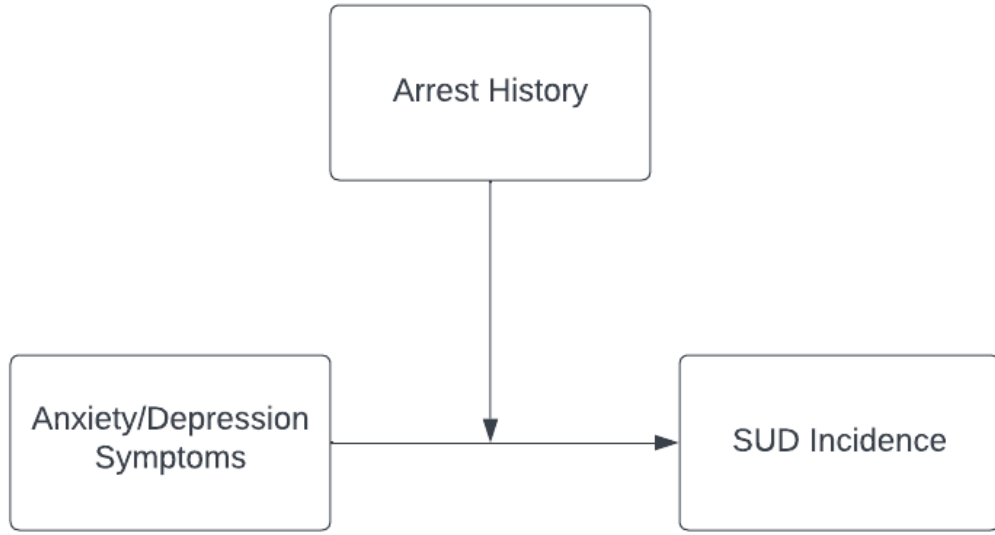
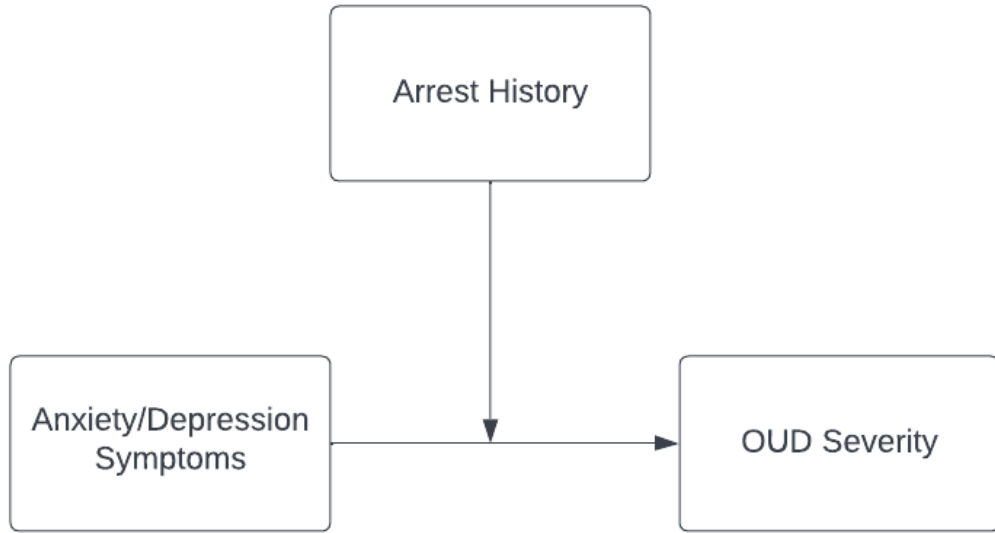


Figure 2. Proposed Model 2



Proposed Model 2

Figure 3. Proposed Model 3



Proposed Model 3

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APPENDICES

APPENDIX A

Description of major depressive disorder criteria, as outlined by the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (APA 2013)

Criterion	Description
A1	Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad, empty, hopeless) or observation made by others (e.g., appears tearful). (Note: In children and adolescents, can be irritable mood.)
A2	Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation).
A3	Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month) or decrease or increase in appetite nearly every day. (Note: In children, consider failure to make expected weight gain.)
A4	Insomnia or hypersomnia nearly every day.
A5	Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down).
A6	Fatigue or loss of energy nearly every day.
A7	Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick).
A8	Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
A9	Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.
B	The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
C	The episode is not attributable to the physiological effects of a substance or another medical condition.
D	The occurrence of the major depressive episode is not better explained by schizoaffective disorder, schizophrenia, schizophreniform disorder, delusional disorder, or other specified and unspecified schizophrenia spectrum and other psychotic disorders.
E	There has never been a manic episode or a hypomanic episode.

APPENDIX B

Description of persistent depressive disorder criteria, as outlined by the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (APA 2013)

Criterion	Description
A	Depressed mood for most of the day, for more days than not, as indicated by either subjective account or observation by others, for at least 2 years.
B1	Poor appetite or overeating.
B2	Insomnia or hypersomnia
B3	Low energy or fatigue
B4	Low self-esteem.
B5	Poor concentration or difficulty making decisions.
B6	Feelings of hopelessness.
C	During the 2-year period (1 year for children or adolescents) of the disturbance, the individual has never been without the symptoms in Criteria A and B for more than 2 months at a time.
D	Criteria for a major depressive disorder may be continuously present for 2 years.
E	There has never been a manic episode or a hypomanic episode, and criteria have never been met for cyclothymic disorder.
F	The disturbance is not better explained by a persistent schizoaffective disorder, schizophrenia, delusional disorder, or other specified or unspecified schizophrenia spectrum and other psychotic disorder.
G	The symptoms are not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hypothyroidism).
H	The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.

APPENDIX C

Description of generalized anxiety disorder criteria, as outlined by the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (APA 2013)

Criterion	Description
A	Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).
B	The individual finds it difficult to control the worry.
C1	Restlessness or feeling keyed up or on edge.
C2	Being easily fatigued.
C3	Difficulty concentrating or mind going blank.
C4	Irritability.
C5	Muscle tension.
C6	Sleep disturbance (difficulty falling or staying asleep, or restless, unsatisfying sleep).
D	The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
E	The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hyperthyroidism).
F	The disturbance is not better explained by another mental disorder (e.g., anxiety or worry about having panic attacks in panic disorder, negative evaluation in social anxiety disorder [social phobia], contamination or other obsessions in obsessive-compulsive disorder, separation from attachment figures in separation anxiety disorder, reminders of traumatic events in posttraumatic stress disorder, gaining weight in anorexia nervosa, physical complaints in somatic symptom disorder, perceived appearance flaws in body dysmorphic disorder, having a serious illness in illness anxiety disorder, or the content of delusional beliefs in schizophrenia or delusional disorder).

APPENDIX D

Description of social anxiety disorder criteria, as outlined by the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (APA 2013)

Criterion	Description
A	Marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others. Examples include social interactions (e.g., having a conversation, meeting unfamiliar people), being observed (e.g., eating or drinking), and performing in front of others (e.g., giving a speech).
B	The individual fears that he or she will act in a way or show anxiety symptoms that will be negatively evaluated (i.e., will be humiliating or embarrassing; will lead to rejection or offend others).
C	The social situations almost always provoke fear or anxiety.
D	The social situations are avoided or endured with intense fear or anxiety.
E	The fear or anxiety is out of proportion to the actual threat posed by the social situation and to the sociocultural context.
F	The fear, anxiety, or avoidance is persistent, typically lasting for 6 months or more.
G	The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
H	The fear, anxiety, or avoidance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition.
I	The fear, anxiety, or avoidance is not better explained by the symptoms of another mental disorder, such as panic disorder, body dysmorphic disorder, or autism spectrum disorder.
J	If another medical condition (e.g., Parkinson's disease, obesity, disfigurement from burns or injury) is present, the fear, anxiety, or avoidance is clearly unrelated or is excessive.

APPENDIX E

Description of opioid use disorder criteria, as outlined by the Diagnostic Statistical Manual of Mental Disorders, Fifth Edition (APA 2013)

A problematic pattern of opioid use leading to clinically significant impairment or distress, as manifested by at least two of the following, occurring within a 12-month period:

Criterion	Description
A1	Opioids are often taken in larger amounts or over a longer period than was intended.
A2	There is a persistent desire or unsuccessful efforts to cut down or control opioid use.
A3	A great deal of time is spent in activities necessary to obtain the opioid, use the opioid, or recover from its effects.
A4	Craving, or a strong desire or urge to use opioids.
A5	Recurrent opioid use resulting in a failure to fulfill major role obligations at work, school, or home.
A6	Continued opioid use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of opioids.
A7	Important social, occupational, or recreational activities are given up or reduced because of opioid use.
A8	Recurrent opioid use in situations in which it is physically hazardous.
A9	Continued opioid use despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance.
A10	Tolerance, as defined by either of the following: A need for markedly increased amounts of opioids to achieve intoxication or desired effect. A markedly diminished effect with continued use of the same amount of an opioid.
A11	Withdrawal, as manifested by either of the following: The characteristic opioid withdrawal syndrome Opioids (or a closely related substance) are taken to relieve or avoid withdrawal symptoms.