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## Motivations for Prescription Drug Misuse Related to Mental Health Problems in Adults

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### Abstract

**Background:** Prescription drug misuse (PDM) is a significant public health problem associated with mental health symptoms.

**Objectives:** This project investigates the connections between PDM motivations and mental health to inform intervention efforts.

**Methods:** Using nationally representative adult data from the 2016–2018 National Survey on Drug Use and Health ( $N = 128,205$ ; 53% female) this project investigated which motivations for misuse are related to past-year mental health problems including any mental illness, serious mental illness, major depressive episode, and suicidal thoughts. Complex samples logistic regression models of the main motivation of PDM for each mental health problem were conducted separately for each prescription drug class (i.e., opioids, tranquilizers, sedatives, and stimulants) while controlling for demographic characteristics.

**Results:** Adults that reported PDM were more likely than those with no PDM to endorse past year mental health problems. Compared to those that reported PDM of other medications, those misusing prescription opioids and tranquilizers to help with emotions and misusing sedatives to “relax or relieve tension” were more likely to have all categories of mental health problems. Those that misused prescription stimulants to “help study” had lower odds of all mental health problems.

**Conclusions:** While there were differences based on prescription drug class, a range of motivations increased adults’ likelihood to have mental health problems and common themes were found across drug classes. While causality is still undetermined, prevention and intervention efforts that are multifaceted and individualized, while broadly providing adults with other ways to cope with negative emotions are likely to help reduce PDM.

### Keywords

Prescription drugs; misuse; non-medical use; motives; mental health; depression

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Declaration of interest

The authors report no relevant disclosures.

## 1. Introduction

The past two decades have witnessed a dramatic increase in the availability and use of prescription drugs, both legitimately and for nonmedical use (National Institute on Drug Abuse, 2021). Prescription drug misuse (PDM) is generally defined by use characteristics (e.g., using more than prescribed, using medication prescribed to someone else) and motives for use (e.g., getting high, increasing alcohol or other drug effects) (Barrett et al., 2008; National Institute on Drug Abuse, 2014). National survey data indicate that approximately 16.9 million people age 12 and older reported past year PDM, approximately 6.2% among the total population; and just over two and a half million (0.9%) met diagnostic criteria for a substance use disorder related to prescription drugs (Center for Behavioral Health Statistics and Quality [CBHSQ], 2019). While there was evidence that some forms of PDM were beginning to decline, as well as related drug overdose deaths in the United States from 2017 to 2018, this varied greatly by the type of prescription drug (e.g., overdose deaths involving natural and semisynthetic opioids decreased by 1% from 2017 to 2018, while overdose deaths involving synthetic opioids continued to increase during the same period, Hedegaard et al., 2020), and there has been a 4% increase in the rate of overdose deaths from 2018 to 2019, which continues to be driven primarily by synthetic opioids other than methadone (Mattson et al., 2021). Given that comorbid mental health problems increase the risk for suicide and overdose (Ashrafioun et al., 2020; Murphy et al., 2018), it is imperative to better understand what motivates PDM, and how those motivations relate to mental problems, so that prevention and intervention efforts can be better tailored.

Prescription drugs differ from alcohol and illicit drugs because of their association with healthcare and their beneficial medical effects when properly used. Overall, PDM is largely motivated by the perception that they are safer than illicit or “street” drugs (Compton & Volkow, 2006). However, upon closer examination of specific motivations, the most prominent often vary by prescription drug class, though in general motives can be categorized into two main categories: (1) self-medication motives which include misusing the medication to achieve the purported clinical effects of the drug (e.g., using opioids for pain management, using sedatives for sleep, using stimulants to increase concentration) and (2) recreational motives which include misusing the medication to achieve effects such as getting high, having a good time with friends, and to increase or decrease the effects of other substances (McCabe et al., 2009b; for a more detailed review see Drazdowski, 2016). Since motivations can be useful in treatment and prevention efforts and have been recognized by Substance Abuse and Mental Health Services Administration (SAMHSA) as an important treatment target (Center for Substance Abuse Treatment, 2013), research investigating how motivations relate, and potentially increase the likelihood of mental health problems, can be used to develop more individualized and efficient treatment efforts.

Existing literature has long linked mental health problems with alcohol, tobacco, and other drug use. Depressive symptoms have been associated with cannabis, tobacco, and other illicit substances such as amphetamines, cocaine, sedatives, and hallucinogens (SAMHSA, 2010; Walters et al., 2018). Studies have noted an association between mental illness and PDM, with misuse three times more likely among people with mental illness (SAMHSA

Archive, 2014; CBHSQ, 2019). These findings continue to be replicated across prescription drug classes (e.g., Compton et al., 2018).

Directionality of the relationship between mental health symptoms and PDM, however, is not always clear and likely often reciprocal (Kroenke et al., 2011). Martins and colleagues (2012) examined longitudinal national data of non-medical prescription opioid use and mood/anxiety disorders. The authors found that all three potential pathways were feasible explanations for the relationship between opioid use and mental health; meaning, prescription opioid misuse can precede and lead to mood/anxiety disorders, such disorders may already exist and lead to misuse (i.e., self-medication), and finally, that mental health and PDM may be working in a bi-directional way (“shared vulnerability”). A more recent review by Sullivan (2018) reflects similar findings. Here, results showed that among a sample of pain patients using opioid therapy, those that were depressed were more likely misuse their prescriptions, and conversely, those that overused opioids were more likely to experience treatment-resistant depression. Ashrafioun and colleagues (2019) found that opioid use disorder and depression, as well as opioid use disorder and alcohol use disorder, demonstrated additive risk for suicide attempts among a veteran population. As such, further study is warranted to continue examining various mental health problems and motivations across different prescription drug classes provided that focus has predominately been on prescription opioids.

Historically, studies of PDM motivations have often focused on the relationship between prescription drugs and other substance use. For example, there is evidence of a positive relationship between the number of motivations for use and an increased risk for problematic substance use (McCabe et al., 2009a). Further, self-treatment (e.g., help sleep, alleviate physical pain) and recreational (e.g., getting high) motivations increase the risk for drinking and other drug use (McCabe et al., 2007). Though, in general, there are more risks associated with recreational motives when compared to self-medication motives, including substance use disorders and other mental health symptoms (e.g., McCabe et al., 2009b; Schepis et al., 2020a, 2021). Negative motivational contexts in particular (e.g., unpleasant emotions, conflict with others, physical discomfort) have been associated with prescription drug use disorders. Kelly and colleagues (2015) examined data from 400 young adults and found both negative and positive motivational contexts were associated with frequency of PDM, but only negative motivational contexts were associated with drug problems and dependence. These findings continue to be replicated with recent nationally representative samples across prescription drug classes (e.g., Compton et al., 2018; Han et al., 2018; Schepis et al., 2020b)

More recently there has been a growing interest the relations between PDM motivations, demographics, and other factors, including mental health problems and suicidality. Much of this work has focused on prescription opioids, and rightful so given the devastating effects of the opioid epidemic. For example, an investigation of 2015 NSDUH data found that suicidal ideation was related to a variety of PDM motivations for prescription opioid misuse including: pain relief; getting high, being hooked, or adjusting for drug effects; relaxation; affect regulation; and help with sleep; and that those with suicidal ideation and/or major depression were also at an increased risk for reporting affect regulation (i.e., help with

feelings/emotions) as their main motivation for prescription opioid misuse (Han et al., 2018). A more recent examination of 2018 NSDUH data found that by allowing respondents to select more than one motivation to describe their PDM gave more nuanced results in terms of risk for different subgroups who reported prescription opioid misuse (Schepis et al., 2020a). Specifically, they found that those identified as “emotional coping” and “multi-motive” latent classes had an elevation in odds of over 200% of past-year suicidal ideation as compared to the “pain relief only” group. Given the devastating impact of suicide and mental health problems, these findings highlight a need to better understand how suicide risk and mental health problems are associated with motivations for PDM.

Investigations of PDM motivations and their connections to mental health problems for other prescription drug classes, namely prescription stimulants, tranquilizers, and sedatives, is only beginning to emerge. Compton and colleagues (2018) found that substance-use-related motivations (i.e., to experiment, to get high, being hooked, or to adjust for other drug effects) for prescription stimulant misuse increased the risk of past-year suicidal ideation relative to the most common motivation: to be alert or concentrate; while the motivations “to help study” and “lose weight” did not. Schepis and colleagues (2021) investigated PDM motivations for the misuse of prescription tranquilizers and sedatives combined and found that compared to those with no PDM all categories of PDM motivations increased mental health problems, including past year serious psychological distress, major depression, and suicidal ideation. Adolescents and adults who endorsed the grouping of recreational motivations generally were even more at risk than those reporting self-treatment only motives. However, there is still a lot to learn about the nuances misuse of these comparatively less popular, but still risky, prescription drug classes.

Moreover, all of these studies have grouped PDM motivations together in some fashion, combined class of prescription medications, only focused on prescription opioids, or only investigated a limited selection of mental health problems. While combining PDM motivations and prescription drug classes can be helpful, especially when establishing overall trends and relations of a phenomenon, the tradeoff is a loss of specificity and a more nuanced understanding of the phenomenon. Therefore, the present study used nationally representative data from the 2016–2018 NSDUH in order to investigate which specific motivations for PDM were related to a variety of mental health problems in the past year including: any mental illness, serious mental illness, major depressive episode, and serious thoughts of suicide. Complex samples logistic regression models of the main motivation for the last instance of PDM for each mental health problem were conducted separately for each prescription drug class (i.e., opioids, tranquilizers, sedatives, and stimulants) using weighted data and controlling for demographic variables. This study expands on previous literature by investigating how PDM motivations relate to a variety of mental health problems focusing on unique motivations for specific prescription drug classes which can be used to help mitigate the negative individual and societal impact of PDM and interrelated mental problems in a targeted manner.

## 2. Material and methods

### 2.1. Participants

Participants included individuals recruited as part of the 2016 to 2018 National Survey on Drug Use and Health (NSDUH). Since most of the mental health questions included in this study were only administered to participants ages 18 and older, participants younger than 18 were excluded. Therefore, of the total 169,486 sample the final sample included 128,205 participants who completed interviews (53.2% female; see details of response rates below). More information about the participant demographics can be found in the annual reports by SAMHSA (CBHSQ, 2017, 2018; SAMHSA, 2019).

### 2.2. Procedures

The NSDUH is an annual survey of the general U.S. civilian population ages 12 or older who are not institutionalized. The NSDUH provides population estimates in the areas of substance use and mental health by using a stratified multistage area probability sample for the United States as a whole, as well as for each state and the District of Columbia. The survey is conducted through face-to-face interviews with participants paid for their time and effort. Details about the NSDUH procedures can be found in the annual reports (CBHSQ, 2017, 2018; SAMHSA, 2019). The weighted screening response rates for all eligible participants (ages 12 and older) was 84% for 2016 (CBHSQ, 2017), 85% for 2017 (CBHSQ, 2018), and 85% for 2018 (SAMHSA, 2019). The weighted percentage of adults 18 and older who completed an interview was 68% for 2016 (CBHSQ, 2017), 66% for 2017 (CBHSQ, 2018), and 66% for 2018 (SAMHSA, 2019). The NSDUH is sponsored by SAMHSA, with oversight by the Research Triangle Institute International Institutional Review Board. For the current study, NSDUH de-identified public use data was analyzed, which is not considered human subjects research. Therefore, IRB approval was not required which was confirmed by the lead author's IRB.

### 2.3. Measures

**2.3.1. Prescription drug misuse**—Prescription drug misuse (PDM) was defined as use in any way not directed by a doctor, including use without a prescription of one's own; use in greater amounts, more often, or longer than told to take a drug; or use in any other way not directed by a doctor. Misuse of over-the-counter drugs was not included.

**2.3.2. Motivations for prescription drug misuse**—Participants who endorsed PDM in the past year were asked to report their main motivation for their last instance of misuse if they reported more than one reason from a select all that applies list of motivations. Those that did not endorse PDM were not asked about motivations. All prescription drug classes included the following motivations: (1) to experiment or to see what the drug is like, (2) to feel good or get high, (3) to increase or decrease the effect(s) of some other drug, (4) because the respondent is "hooked" or has to have the drug, or (6) for some other reason. Prescription opioids, tranquilizers, and sedatives also included: to relax or relieve tension, to help with sleep, and to help with feelings or emotions. Prescription opioids also included to relieve physical pain. Prescription stimulants also included to help lose weight, to help concentrate, to help be alert or stay awake, and to help study. If participants reported that

“some other reason” was their main reason for their last misuse, then their response was logically assigned from the write-in data to fit a listed motivation. If a write-in response did not correspond to the list of motivations but was considered a valid reason it was included as “some other reason.”

**2.3.3. Mental illness**—Due to time constraints and the need for trained mental health clinicians to administer a clinical diagnostic interview to all participants annually, the NSDUH employs the use of short scales that measure psychological distress (i.e., Kessler-6 (K6) and functional impairment (i.e., World Health Organization Disability Assessment Schedule (WHODAS)) which are imputed into a statistical weighted model along with other relevant variables (i.e., serious thoughts of suicide in the past year, having a past year major depressive episode (MDE), and age) that predicts whether the participant had mental illness. The model is based on response from a subsample of participants in 2008 and 2012 that were recruited for a follow-up clinical interview that consisted of a complete diagnostic assessment for mental disorders (mood, anxiety, eating, intermittent explosive, or adjustment disorder) in the previous 12 months based on the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (DSM-IV; American Psychiatric Association, 1994) using an adapted version of the Structured Clinical Interview for DSM (SCID, First et al., 2002). Functional impairment was measured by the Global Assessment of Functioning (GAF) scale (Endicott et al., 1976); with 50 or less signaling substantial impairment in completing everyday tasks and those participants were classified as have serious mental illness (SMI). The GAF was used as part of the full diagnostic assessment for the selected subsample, but is not collected annually and therefore not available in the publicly available datasets. Of note, developmental disorders and substance use disorders were excluded in the models. Current participants’ responses from the annual survey including K6 (Kessler et al., 2003) and WHODAS (Novak et al., 2010) total scores, serious thoughts of suicide in the past year, having a past year major depressive episode (MDE), and age are used as predictors variables in the model. The K6 in the annual NSDUH consists of six questions about frequency of symptoms of psychological distress experiences (e.g., nervous, hopeless, restless or fidgety, symptoms of depression) in the past 30 days, and again, if applicable, in the one month in the past year when participants were at their worst emotionally (i.e., if they reported that there was a time in the past 12 months when they felt more depressed, anxious, or emotionally stressed than they felt during the past 30 days). The modified WHODAS includes eight items that assess participants’ difficulty level performing selected life skills (e.g., memory, concentration, getting around on own, participating in social activities, completing household and school/work responsibilities, getting work done quickly) if any items on the K6 are endorsed. More details about the scales and modeling procedures can be found in the NSDUH *Methodological summary and definitions* (CBHSQ, 2017, 2018; SAMHSA, 2019).

**2.3.3.1. Any mental illness.:** Participants were considered to have any mental illness (AMI) if they were predicted to have any diagnosis regardless of level of functional impairment, including individuals with serious mental illness (SMI) described below. In the present study, AMI was coded: 0 = No mental illness in the past year, 1 = AMI in the past year.

**2.3.3.2. Serious mental illness:** Participants were considered to have SMI if they were predicted to have any diagnosis with a substantial level of functional impairment. In the present study, SMI was coded: 0 = No SMI in the past year, 1 = SMI in the past year.

**2.3.4. Major depressive episode**—Adult participants were categorized as having a major depressive episode (MDE) based on criteria from DSM-IV (American Psychiatric Association, 1994) if they reported a period of two weeks or longer in the past year when they experienced a depressed mood or loss of pleasure or interest in daily activities, and reported additional symptoms, such as problems with sleep, eating, energy, concentration, and self-worth. Exact question wording and comments of measurement issues for MDE are included in the NSDUH *Methodological summary and definitions* (CBHSQ, 2017, 2018; SAMHSA, 2019). Participants could be categorized as having a MDE and be either in the AMI and/or SMI category as well depending on their predictive norming from the model described above. In the present study, MDE was coded: 0 = No MDE in the past year, 1 = MDE in the past year.

**2.3.5. Serious thoughts of suicide**—Participants were asked a single question if at any time during the past year they had thought seriously about trying to kill themselves (0 = No serious thoughts of suicide in the past year; 1 = Seriously thought about killing self in the past year). Participants endorsing suicidal thoughts may or may not be classified as having AMI, SMI, or MDE.

## 2.4. Data analyses

Statistical analyses were conducted using SPSS, version 26 (IBM, 2019) and followed the Substance Abuse and Mental Health Data Archive (2014) guidelines for the NSDUH's stratified cluster sample design. More information about the sample design and weighting can be found in CBHSQ (2017, 2018) and SAMHSA (2019). The analyses were performed using complex samples logistic regression models across four dichotomous outcomes: AMI, SMI, MDE, and serious thoughts of suicide. The predictors were the main motivations for PDM (most recent instance) across four drug classes: opioids, tranquilizers, sedatives, and stimulants. A separate model was performed for each mental health problem and drug class. Prior to analysis, and due to low rates of endorsement, some motivation categories were removed ( $N < 25$ ) and are specified in the Results for each category. The motivation predictors were entered as dummy coded indicators, with the reference group (i.e., intercept) reflecting no misuse of the focal prescription drug. For example, for prescription opioid misuse, the reference group was individuals who reported misusing a prescription drug other than opioids (i.e., tranquilizers, sedatives, or stimulants). Two additional indicators were included to differentiate those who misused the focal prescription drug from (1) those who endorsed misuse of the focal prescription drug without endorsing any motivations (i.e., reported they misused the focal prescription drug but did not identify their main motivation for misuse), and (2) those who did not misuse *any* prescription drug (i.e., non-users). The models included control variables for age (18–25, 26–64, 65+, categorized as young adult, middle adult, and older adult to capture known ages differences between these categories in PDM trends (e.g., Schepis et al., 2020b)), sex (female, male), household income (less than \$20,000, \$20,000–\$49,999, \$50,000–\$74,999, \$75,000 or more), population density

(segment in a Core Based Statistical Area (CBSA) with 1 million or more persons, segment in a CBSA with fewer than 1 million persons, segment not in a CBSA), and race (seven categories). Holding these variables constant, the results reflect the difference in log-odds of mental health problems for each predictor relative to the log-odds for no misuse of the focal drug.

### 3. Results

Reports on the frequencies of motivations for PDM and mental health problems across years can be found online at <http://www.samhsa.gov/data/>. In the current sample 91% reported no PDM, almost 7% reported misuse of one prescription drug class, 2% reported misuse of two prescription drug classes, and <1% reported misuse of three or four prescription drugs classes.

#### 3.1. Prescription opioids

The results for misuse of prescription opioids are reported in Table 1. As expected, those that did not misuse any prescription drugs had lower odds of experiencing all mental health problems (ORs range: 0.32–0.39). Among those who misused prescription opioids, compared to those who misused other prescription drugs, individuals who reported their main motivations were “feel good/get high” (ORs range: 1.48–1.73) or “help with feelings or emotions” (ORs range: 5.32–7.84) were significantly more likely to have all categories of mental health problems (i.e., AMI, SMI, MDE, and serious thoughts of suicide). Additionally, those that reported prescription opioid misuse and the following motivations had significantly increased odds of the specific subsequent mental health problems: (1) reporting “relax or relieve tension” was associated with increased odds of AMI (OR = 1.57, 95% CI [1.18, 2.10]) and experiencing serious thoughts of suicide (OR = 1.55, 95% CI [1.11, 2.14]); (2) reporting the motivation “hooked or have to have the drug” was associated with increased odds of AMI (OR = 2.67, 95% CI [1.51, 4.75]) and SMI (OR = 2.38, 95% CI [1.26, 4.50]); and (3) reporting “relieve physical pain” (OR = 1.24, 95% CI [1.01, 1.52]), “experiment/see what like” (OR = 1.73, 95% CI [1.09, 2.73]), and “help with sleep” (OR = 1.70, 95% CI [1.04, 2.80]) were also associated with increased odds of experiencing serious thoughts of suicide. Finally, those that reported prescription opioid misuse and endorsed no motivation were less likely to be diagnosed with AMI (OR = 0.45, 95% CI [0.30, 0.68]) compared to those that misused other prescription drugs.

#### 3.2. Prescription tranquilizers

The results for misuse of prescription tranquilizers are reported in Table 2. The motivation “hooked or have to have the drug” was removed because of low endorsement. Again, those that did not misuse any prescription drugs had significantly lower odds of all mental health problems (ORs range: 0.31–0.40). Among those who misused prescription tranquilizers, compared to those who misused other prescription drugs, individuals who reported their main motivations were “relax or relieve tension” (ORs range: 1.31–1.62), “help with sleep” (ORs range: 1.38–1.47), or “help with feelings or emotions” (ORs range: 2.79–4.25) were significantly more likely to have all categories of mental health problems (i.e., AMI, SMI, MDE, and serious thoughts of suicide). Additionally, those that reported



prescription tranquilizer misuse and endorsed the following motivations had significantly increased odds of the subsequent mental health problems: reporting “increase/decrease effects of other drugs” was associated with greater odds of AMI and MDE (ORs range = 1.87–2.20); and “feel good/get high” (OR = 1.51, 95% CI [1.13, 2.02]) and “some other reason” (OR = 2.82, 95% CI [1.43, 5.56]) was associated with greater odds of experiencing serious thoughts of suicide. Finally, those that reported prescription tranquilizer misuse and endorsed “experiment/see what like” were less likely to be diagnosed with AMI (OR = 0.72, 95% CI [0.55, 0.95]) compared to those that misused other prescription drugs.

### 3.3. Prescription sedatives

The results for misuse of prescription sedatives are reported in Table 3. The following motivations were removed because of low endorsement: “experiment/see what like,” “help with feelings or emotions,” “increase/decrease effects of other drugs,” “hooked or have to have drug,” “some other reason,” and those that reported misuse of prescription sedatives but endorsed no motivation. Consistent with the prior results, those that did not misuse any prescription drugs significantly lower odds of all mental health problems (ORs range: 0.28–0.36). Among those who misused prescription sedatives, compared to those who misused other prescription drugs, individuals who reported their main motivation was “relax or relieve tension” (ORs range: 2.05–3.37) were significantly more likely to have all categories of mental health problems (i.e., AMI, SMI, MDE, and serious thoughts of suicide). Additionally, those that reported prescription sedative misuse and endorsed the following motivations had significantly increased odds of the subsequent mental health problems: (1) reporting “feel good/get high” was associated with greater odds of experiencing AMI, SMI, MDE (ORs range: 2.27–3.22); and (2) reporting “help with sleep” was associated with greater odds of experiencing AMI, SMI, and serious thoughts of suicide (ORs range: 1.39–1.45).

### 3.4. Prescription stimulants

The results for misuse of prescription stimulants are reported in Table 4. The motivation “hooked or have to have the drug” was removed because of low endorsement. Again, those that did not misuse any prescription drugs significantly lower odds of all mental health problems (ORs range: 0.26–0.34). Further, among those who misused prescription stimulants, compared to those who misused other prescription drugs, individuals who report their main motivation was “help study” (ORs range: 0.50–0.64) also had significantly lower odds of all mental health problems (i.e., AMI, SMI, MDE, and serious thoughts of suicide). Additionally, those that reported misusing prescription stimulants and endorsed no motivations were also less likely to have an AMI, SMI, and MDE (ORs range: 0.23–0.41). On the other hand, those that reported “some other reason” as the main motivation of misuse were more likely to have AMI (OR = 2.09, 95% CI [1.09, 4.01]) and MDE (OR = 1.77, 95% CI [1.03, 3.04]).

## 4. Discussion

This study used data from a large, nationally representative dataset to examine whether motivations to misuse prescription drugs were associated with a variety of mental

health problems in the past year. We examined the associations between motivations for prescription misuse of opioids, tranquilizers, sedatives, and stimulants separately, given that motivations may differ among different classes of drugs. Consistent with prior literature (e.g., Compton et al., 2018), PDM in general was associated with a greater likelihood of having any of the mental health problems investigated. This is not surprising given that a proportion of the population that misuses prescription medications have been prescribed the medication, so are more likely to have the mental health problems the medications are designed to treat.

A variety of motivations were associated with the presence of mental health problems across several classes of prescription drugs. However, the largest and most robust effects were observed between motivations to misuse prescription drugs to help with emotions and relieve tension. Indeed, endorsing the motivation to “relax/relieve tension” was associated with significantly increased odds of having a mental health problem across those who used opioids, tranquilizers, and sedatives (compared to those who did not misuse each of these prescription drug classes). The odds of having a mental health problem when endorsing this motivation was particularly high among those who reported misusing sedatives, with those missing sedatives to relax or relieve tension two to three times as likely as those who misused prescription drugs other than sedatives to have any mental health problem. Similarly, individuals who endorsed that they misused prescription opioids or tranquilizers to help with feelings or emotions were over two to nearly 8 times as likely to have any mental health problem compared to those who misused prescription drugs other than opioids and tranquilizers.

For over half of a century, tension reduction (Conger, 1956) and self-medication (Khantzian, 1987) theories have posited that individuals may turn to substances to alleviate negative affect. The negative reinforcement of the substance leads to a pattern of misuse, as well as maintenance of the negative emotions (Stewart & Conrod, 2008). Indeed, the associations between disorders characterized by negative affect and substance use disorders are well-documented (Grant et al., 2004; Wolitzky-Taylor et al., 2012). This study demonstrates that coping motivations (e.g., to alleviate tension/relax or to cope with feelings and emotions) to misuse prescription drugs are similar to those observed with illicit substances. This finding provides the basis for future work to examine whether these motivations may explain the associations between mental disorders (many of which are associated by, or characterized by elevated negative affect) and substance use disorders involving the misuse of prescription drugs (e.g., opioid use disorder). If motivation to cope with emotions statistically explains these associations, interventions that aim to teach more adaptive tools for managing and decreasing negative emotion may result in reductions in prescription drug misuse as a way to cope.

In addition to the broadly observed finding linking motivations to handle emotions with misuse of prescription drugs and a variety of mental disorders, some other motivations to misuse specific classes of prescription drugs were linked to mental health problems. When enhancement motivations (i.e., “to feel good/get high”) were endorsed by those who misused opioids, tranquilizers, and sedatives, this was associated with greater odds of having a variety of mental health problems. Therefore, high odds of having a mental health

problem were associated not only with coping motives to decrease negative affect, but also to increase positive affect. These finding suggests that those misusing opioids, tranquilizers, and sedatives should also be assessed for anhedonia, and could benefit from interventions that aim to increase positive affect (e.g., behavioral activation; Martell et al., 2010).

Further, those who misused prescription tranquilizers and endorsed using them for sleep were more likely to have any mental health problem, and endorsing sleep as a motivation for misusing opioids and sedatives was associated specifically with risk for experiencing suicidality. Indeed, the role of sleep disturbance in suicidal thoughts and behavior is well-documented (Bernert & Joiner, 2007). Since prescription drugs are no longer recommended as the first line of treatment for insomnia due to reduced effectiveness over time, side effect profiles, and high abuse potential (Matheson & Hainer, 2017), assessing and targeting sleep problems via behavioral intervention may be an effective prevention and intervention tool for reducing PDM and mental health problems. Treatments such as cognitive-behavioral therapy for insomnia (CBT-I) and targeting related lifestyle problems (e.g., stress, inconsistent sleep schedules) have large effect sizes for improving sleep (Trauer et al., 2015). Since CBT-I is safer and more effective than prescription medication in improving sleep (see Morin, 2015), it is considered the treatment of choice by the American Academy of Sleep Medicine (Morgenthaler et al., 2006) and the American College of Physicians (Qaseem et al., 2016), and may be a useful intervention for those who misuse prescription tranquilizers and sedatives. This finding underscores the importance of identifying safer solutions to address sleep among those at risk for suicide in particular.

Motivations to misuse prescription opioids due to “being hooked” were also associated with a variety of mental health problems; with those endorsing an addiction motivation being almost three times as likely to report any past year mental illness. Given the addiction potential of opioids (see Kolodny et al., 2015) and the longitudinal evidence linking mental disorders to prescription opioid misuse (Sullivan et al., 2006), it is not surprising that motivations to misuse due to addiction would be associated with mental health problems. However, these findings point to the primary limitation of this study, which is the cross-sectional nature of the data, precluding us from drawing directional conclusions. Based on prior literature, it is more likely that the presence of a mental health problem temporally predicts greater likelihood of opioid addiction, than the other way around.

Interestingly, while a commonly reported motive (Han et al., 2018), pain relief was only found to increase the risk of serious thoughts of suicide, but not increase the risk of mental illness or a major depressive episode for those who misused prescription opioids compared to those that misused other prescription drugs. This suggests that assessing and addressing pain relief through appropriate medication and other evidence-based treatments (e.g., exercise, mindfulness-based stress reduction; Qaseem et al., 2017) is important, particularly for those at-risk or experiencing suicidal thoughts. However, being motivated to misuse opioids for pain relief was not a risk factor for other studied mental health problems which has been supported by other studies and aligns with findings that self-treatment motivations are associated with less overall risk, as compared to recreational motives (Schepis et al., 2020a). A pattern that is replicated across other prescription drug classes (e.g., Compton et al., 2018; Schepis et al., 2021). Therefore, different approaches to reduce prescription

drug misuse may be necessary depending on the populations targeted and the motives for misuse (e.g., those self-adjusting their dosage to achieve the desired clinical effect, those misusing others' medications for self-treatment motives, those misusing others' medications for recreational motives). It will also be important to consider how motives and sources of prescriptions that are misused change over the lifespan (Schepis et al., 2020b).

There is also evidence that the current list of motivations for PDM may not capture all of the motivations that are influencing the relations between PDM and mental health problems. For example, "some other reason," was found to significantly predict suicidal thoughts for the misuse of tranquilizers, and any mental illness and MDE for those misusing stimulants, compared to those misusing other prescription medications. This calls for future research investigations, specifically for the motivations to misuse prescription tranquilizations and stimulants on what may be missing from the current conceptualizations of common motivations. Qualitative and mixed methods approaches may be the best suited for answering these questions. Focusing this work on individuals who report suicidal thoughts and MDE would lead to the most initial impact.

Further, among the motivations to misuse prescription stimulants, several motivations were removed from the analyses due to low endorsement, and most people who misused stimulants (compared to other prescription drugs) reported "other" motivations or did not answer the motivation question, suggesting that there may be additional, unstudied motivations for misusing stimulants that were not adequately assessed in this study or a lack of comprehension of the question, leading us to wonder whether motivations for stimulant misuse are less well understood and deserving of more developmental/exploratory work. Nonetheless, those who reported misusing stimulants to study were *less* likely to have a mental health problem. Similar to the self-treatment motivations for opioid misuse discussed above, these results support previous work documenting that self-treatment motives tend to carry less risks than recreational motives for stimulants specifically, in particular for the motivation "to help study" (Compton et al., 2018). These findings suggest that screening for motivations to misuse stimulants may be important for clinicians to understand mental health risks or associations.

There were several strengths of the present study, including the use of a large representative sample and a comprehensive analysis to examine the associations between several motivations for misusing several types of prescription drugs and several manifestations of mental health problems while controlling for a range of demographic factors. However, there were some limitations. First, as described above, the cross-sectional nature of these data preclude us from drawing conclusions about the direction of these effects. Future longitudinal research is needed to examine these questions. Second, some motivations were endorsed so infrequently that they were removed from analyses. This is not necessarily a limitation of the study itself, since it provides descriptive information about the frequencies with which specific motivations to misuse specific prescription drugs were endorsed. However, it does limit some of the more nuanced questions that can be asked. Third, as with the majority of large-scale surveys, this study is limited by measures that rely exclusively on self-report, which may be biased; and by selection biases that may have limited representativeness and generalizability. Finally, clinical diagnoses were not based on

the most recent categories of diagnoses (i.e., used DSM-IV criteria) and were calculated using a predictive model which inherently enters error in the estimation process. Therefore, the findings around the categories of AMI and SMI should be considered with caution and recognition that the findings may not accurately generalize to those recently diagnosed using updated criteria.

## 5. Conclusions

The present study found that across the majority of types of prescription drugs, and across a variety of categories of mental health problems, several different motivations to misuse prescription drugs were associated with mental health problems. In particular, across three of the four types of prescription drugs, motivations to misuse prescription drugs to help with emotions and to relax or relieve tension were associated with significantly greater odds of having mental health problems than those who misused the other types of prescription drugs in each set of analyses. The exception was with stimulants, in which the motivation to help with studying was observed as being less likely to be associated with mental health problems for individuals who misused prescription stimulants compared to those that misused other prescription drugs. These findings suggest that programs that address co-morbid prescription drug misuse and mental health problems are warranted. Additionally, clinicians should be assessing motivations to misuse prescription drugs in a variety of mental health and substance use disorder clinical settings, and including treatment components to target these motivations as indicated. For example, addressing underlying anxiety and mood symptoms through effective cognitive and behavioral interventions has the potential not only to decrease symptoms that may lead to prescription drug misuse, but also to teach more adaptive skills for managing these symptoms when they do arise. Taken together, these findings highlight the importance of case conceptualization in individualizing treatment plans based on the patient's specific motivations for prescription drug misuse are needed given the variety of motivations that were found to be related to mental health problems.

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## Data availability statement

The data associated with this manuscript is available for public download at: <http://www.samhsa.gov/data/>.

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**Table 1.** Logistic regressions for motivations to misuse prescription opioids predicting mental health problems.

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
<i>Past year any mental illness vs. No past year mental illness<sup>a</sup></i>					
Intercept (Did not misuse this substance)	0.52	0.04	.000	1.67	[1.53, 1.83]
Relieve physical pain	0.09	0.07	.211	1.09	[0.95, 1.25]
Relax or relieve tension	0.45	0.14	.003	1.57	[1.18, 2.10]
Experiment/see what like	0.37	0.21	.079	1.45	[0.96, 2.20]
Feel good/get high	0.39	0.09	.000	1.48	[1.23, 1.77]
Help with sleep	0.24	0.18	.195	1.27	[0.88, 1.82]
Help with feelings or emotions	2.06	0.21	.000	7.84	[5.20, 11.83]
Increase/decrease the effects of other drugs	0.23	0.44	.611	1.25	[0.52, 3.03]
Hooked or have to have drug	0.98	0.29	.001	2.67	[1.51, 4.75]
Some other reason	0.06	0.29	.852	1.06	[0.59, 1.90]
Misused, no motivation endorsed	-0.80	0.20	.000	0.45	[0.30, 0.68]
Did not misuse any substance	-1.04	0.04	.000	0.35	[0.33, 0.38]
<i>Past year serious mental illness vs. No past year serious mental illness<sup>b</sup></i>					
Intercept (Did not misuse this substance)	-0.77	0.07	.000	0.46	[0.40, 0.53]
Relieve physical pain	0.12	0.10	.267	1.12	[0.91, 1.38]
Relax or relieve tension	0.28	0.17	.101	1.32	[0.95, 1.85]
Experiment/see what like	0.38	0.25	.130	1.46	[0.89, 2.40]
Feel good/get high	0.49	0.14	.001	1.63	[1.23, 2.16]
Help with sleep	0.28	0.25	.258	1.33	[0.81, 2.19]
Help with feelings or emotions	1.67	0.21	.000	5.32	[3.46, 8.18]
Increase/decrease the effects of other drugs	-0.08	0.50	.877	0.93	[0.34, 2.53]
Hooked or have to have drug	0.87	0.32	.008	2.38	[1.26, 4.50]
Some other reason	0.62	0.35	.080	1.87	[0.93, 3.77]
Misused, no motivation endorsed	-0.34	0.31	.267	0.71	[0.38, 1.31]
Did not misuse any substance	-1.15	0.06	.000	0.32	[0.28, 0.36]

*Past year major depressive episode vs. No past year major depressive episode<sup>c</sup>*

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
Intercept (Did not misuse this substance)	-0.38	0.06	.000	0.69	[0.61, 0.77]
Relieve physical pain	0.08	0.10	.381	1.09	[0.90, 1.32]
Relax or relieve tension	0.21	0.17	.240	1.23	[0.87, 1.73]
Experiment/see what like	0.30	0.21	.162	1.34	[0.89, 2.04]
Feel good/get high	0.40	0.11	.001	1.49	[1.20, 1.85]
Help with sleep	0.16	0.21	.453	1.17	[0.77, 1.77]
Help with feelings or emotions	1.39	0.20	.000	4.00	[2.66, 6.00]
Increase/decrease the effects of other drugs	-0.09	0.46	.852	0.92	[0.36, 2.32]
Hooked or have to have drug	0.42	0.31	.182	1.52	[0.82, 2.83]
Some other reason	0.54	0.31	.089	1.72	[0.92, 3.21]
Misused, no motivation endorsed	-0.52	0.33	.120	0.60	[0.31, 1.15]
Did not misuse any substance	-0.94	0.05	.000	0.39	[0.35, 0.44]

*Past year serious thoughts of suicide vs. No past year serious thoughts of suicide<sup>d</sup>*

Intercept (Did not misuse this substance)	-0.88	0.07	.000	0.42	[0.36, 0.48]
Relieve physical pain	0.22	0.10	.037	1.24	[1.01, 1.52]
Relax or relieve tension	0.44	0.16	.010	1.55	[1.11, 2.14]
Experiment/see what like	0.55	0.23	.020	1.73	[1.09, 2.73]
Feel good/get high	0.55	0.14	.000	1.73	[1.30, 2.30]
Help with sleep	0.53	0.25	.037	1.70	[1.04, 2.80]
Help with feelings or emotions	1.84	0.22	.000	6.32	[4.05, 9.86]
Increase/decrease the effects of other drugs	-0.55	0.49	.267	0.58	[0.21, 1.55]
Hooked or have to have drug	0.49	0.26	.070	1.63	[0.96, 2.76]
Some other reason	0.54	0.35	.127	1.72	[0.85, 3.46]
Misused, no motivation endorsed	0.27	0.31	.388	1.31	[0.70, 2.44]
Did not misuse any substance	-1.05	0.06	.000	0.35	[0.31, 0.40]

Note. Included age, sex, household income, population density, and race as covariates. Reference category = No misuse of this prescription drug.

<sup>a</sup>Model: Wald  $F(25, 26) = 180.87, p < .001, R^2 = .06$  (Cox & Snell), .09 (Nagelkerke).

<sup>b</sup>Model: Wald  $F(25, 26) = 138.37, p < .001, R^2 = .03$  (Cox & Snell), .11 (Nagelkerke).

<sup>c</sup>Model: Wald  $F(25, 26) = 138.63, p < .001, R^2 = .04$  (Cox & Snell), .09 (Nagelkerke).

<sup>d</sup>Model: Wald  $F(25, 26) = 65.76, p < .001, R^2 = .03$  (Cox & Snell), .09 (Nagelkerke).

**Table 2.** Logistic regressions for motivations to misuse prescription tranquilizers predicting mental health problems.

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
<i>Past year any mental illness vs. No past year mental illness<sup>a</sup></i>					
Intercept (Did not misuse this substance)	0.49	0.04	.000	1.63	[1.50, 1.77]
Relax or relieve tension	0.48	0.08	.000	1.62	[1.38, 1.90]
Experiment/see what like	-0.33	0.14	.023	0.72	[0.55, 0.95]
Feel good/get high	0.25	0.13	.050	1.29	[1.00, 1.66]
Help with sleep	0.32	0.12	.009	1.38	[1.09, 1.76]
Help with feelings or emotions	1.45	0.11	.000	4.25	[3.41, 5.31]
Increase/decrease effects of other drugs	0.62	0.31	.046	1.87	[1.01, 3.44]
Some other reason	0.37	0.33	.271	1.45	[0.74, 2.81]
Misused, no motivation endorsed	-0.06	0.43	.883	0.94	[0.39, 2.24]
Did not misuse any substance	-1.01	0.04	.000	0.36	[0.34, 0.39]
<i>Past year serious mental illness vs. No past year serious mental illness<sup>b</sup></i>					
Intercept (Did not misuse this substance)	-0.76	0.06	.000	0.47	[0.41, 0.53]
Relax or relieve tension	0.28	0.09	.003	1.33	[1.11, 1.60]
Experiment/see what like	-0.25	0.27	.367	0.78	[0.45, 1.35]
Feel good/get high	0.12	0.14	.393	1.13	[0.85, 1.51]
Help with sleep	0.33	0.13	.015	1.39	[1.07, 1.80]
Help with feelings or emotions	1.23	0.12	.000	3.44	[2.68, 4.41]
Increase/decrease effects of other drugs	0.74	0.37	.051	2.10	[1.00, 4.42]
Some other reason	0.62	0.32	.058	1.86	[0.98, 3.54]
Misused, no motivation endorsed	0.03	0.39	.934	1.03	[0.47, 2.28]
Did not misuse any substance	-1.16	0.05	.000	0.31	[0.28, 0.35]
<i>Past year major depressive episode vs. No past year major depressive episode<sup>c</sup></i>					
Intercept (Did not misuse this substance)	-0.39	0.06	.000	0.68	[0.61, 0.76]
Relax or relieve tension	0.27	0.09	.006	1.31	[1.09, 1.57]
Experiment/see what like	-0.29	0.25	.243	0.75	[0.45, 1.23]
Feel good/get high	-0.00	0.18	.994	1.00	[0.70, 1.44]

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
Help with sleep	0.38	0.16	.018	1.47	[1.07, 2.01]
Help with feelings or emotions	1.03	0.13	.000	2.79	[2.15, 3.63]
Increase/decrease effects of other drugs	0.79	0.33	.021	2.20	[1.13, 4.27]
Some other reason	0.35	0.34	.308	1.42	[0.72, 2.79]
Misused, no motivation endorsed	-0.95	0.47	.047	0.39	[0.15, 0.99]
Did not misuse any substance	-0.93	0.05	.000	0.40	[0.36, 0.44]
<i>Past year serious thoughts of suicide vs. No past year serious thoughts of suicide<sup>d</sup></i>					
Intercept (Did not misuse this substance)	-0.82	0.07	.000	0.44	[0.38, 0.51]
Relax or relieve tension	0.29	0.10	.004	1.34	[1.10, 1.62]
Experiment/see what like	-0.32	0.25	.211	0.73	[0.44, 1.21]
Feel good/get high	0.42	0.14	.006	1.51	[1.13, 2.02]
Help with sleep	0.36	0.14	.013	1.43	[1.08, 1.89]
Help with feelings or emotions	1.12	0.13	.000	3.06	[2.36, 3.98]
Increase/decrease effects of other drugs	0.42	0.42	.316	1.52	[0.66, 3.51]
Some other reason	1.04	0.34	.003	2.82	[1.43, 5.56]
Misused, no motivation endorsed	0.55	0.41	.181	1.73	[0.77, 3.92]
Did not misuse any substance	-1.12	0.06	.000	0.33	[0.29, 0.37]

Note: Included age, sex, household income, population density, and race as covariates. Reference category = No misuse of this prescription drug.

<sup>a</sup>Model: Wald  $F(23, 28) = 224.07, p < .001, R^2 = .06$  (Cox & Snell), .09 (Nagelkerke).

<sup>b</sup>Model: Wald  $F(23, 28) = 124.20, p < .001, R^2 = .03$  (Cox & Snell), .10 (Nagelkerke).

<sup>c</sup>Model: Wald  $F(23, 28) = 154.97, p < .001, R^2 = .04$  (Cox & Snell), .09 (Nagelkerke).

<sup>d</sup>Model: Wald  $F(23, 28) = 102.68, p < .001, R^2 = .03$  (Cox & Snell), .09 (Nagelkerke).

Logistic regressions for motivations to misuse prescription sedatives predicting mental health problems.

**Table 3.**

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
<i>Past year any mental illness vs. No past year mental illness<sup>a</sup></i>					
Intercept (Did not misuse this substance)	0.61	0.03	.000	1.85	[1.73, 1.98]
Relax or relieve tension	0.72	0.26	.007	2.05	[1.23, 3.42]
Feel good/get high	1.17	0.44	.011	3.22	[1.33, 7.84]
Help with sleep	0.37	0.14	.008	1.45	[1.11, 1.90]
Did not misuse any substance	-1.14	0.03	.000	0.32	[0.30, 0.34]
<i>Past year serious mental illness vs. No past year serious mental illness<sup>b</sup></i>					
Intercept (Did not misuse this substance)	-0.65	0.06	.000	0.52	[0.47, 0.59]
Relax or relieve tension	1.21	0.33	.001	3.37	[1.75, 6.49]
Feel good/get high	0.94	0.43	.032	2.56	[1.09, 6.03]
Help with sleep	0.36	0.13	.010	1.43	[1.10, 1.87]
Did not misuse any substance	-1.27	0.05	.000	0.28	[0.26, 0.31]
<i>Past year major depressive episode vs. No past year major depressive episode<sup>c</sup></i>					
Intercept (Did not misuse this substance)	-0.30	0.05	.000	0.74	[0.68, 0.82]
Relax or relieve tension	0.84	0.25	.001	2.32	[1.40, 3.83]
Feel good/get high	0.82	0.36	.027	2.27	[1.10, 4.67]
Help with sleep	0.31	0.16	.051	1.37	[1.00, 1.87]
Did not misuse any substance	-1.02	0.04	.000	0.36	[0.33, 0.39]
<i>Past year serious thoughts of suicide vs. No past year serious thoughts of suicide<sup>d</sup></i>					
Intercept (Did not misuse this substance)	-0.69	0.06	.000	0.50	[0.44, 0.56]
Relax or relieve tension	1.11	0.33	.002	3.04	[1.56, 5.95]
Feel good/get high	0.73	0.37	.052	2.08	[0.99, 4.37]
Help with sleep	0.33	0.13	.012	1.39	[1.08, 1.78]
Did not misuse any substance	-1.24	0.05	.000	0.29	[0.26, 0.32]

Note. Included age, sex, household income, population density, and race as covariates. Reference category = No misuse of this prescription drug.

<sup>a</sup>Model: Wald  $F(18, 33) = 230.52, p < .001, R^2 = .06$  (Cox & Snell), .09 (Nagelkerke).

<sup>b</sup>Model: Wald  $F(18, 33) = 170.06, p < .001, R^2 = .03$  (Cox & Snell), .10 (Nagelkerke).

<sup>c</sup>Model: Wald  $F(18, 33) = 245.24, p < .001, R^2 = .03$  (Cox & Snell), .09 (Nagelkerke).

<sup>d</sup>Model: Wald  $F(18, 33) = 126.16, p < .001, R^2 = .03$  (Cox & Snell), .09 (Nagelkerke).

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**Table 4.** Logistic regressions for motivations to misuse prescription stimulants predicting mental health problems.

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
<i>Past year any mental illness vs. No past year mental illness<sup>a</sup></i>					
Intercept (Did not misuse this substance)	0.69	0.05	.000	2.00	[1.82, 2.19]
Help lose weight	0.05	0.24	.849	1.05	[0.64, 1.71]
Help concentrate	-0.07	0.10	.485	0.93	[0.76, 1.14]
Help be alert or stay awake	0.01	0.08	.918	1.01	[0.86, 1.18]
Help study	-0.64	0.11	.000	0.53	[0.42, 0.66]
Experiment/see what like	0.06	0.20	.759	1.07	[0.71, 1.61]
Feel good/get high	0.22	0.15	.155	1.24	[0.92, 1.68]
Increase/decrease effect of other drugs	0.11	0.40	.790	1.11	[0.50, 2.46]
Some other reason	0.74	0.33	.028	2.09	[1.09, 4.01]
Misused, no motivation endorsed	-1.06	0.29	.001	0.35	[0.19, 0.62]
Did not misuse any substance	-1.20	0.03	.000	0.30	[0.28, 0.32]
<i>Past year serious mental illness vs. No past year serious mental illness<sup>b</sup></i>					
Intercept (Did not misuse this substance)	-0.53	0.06	.000	0.59	[0.52, 0.67]
Help lose weight	0.51	0.29	.088	1.66	[0.93, 2.99]
Help concentrate	-0.11	0.13	.378	0.89	[0.69, 1.15]
Help be alert or stay awake	-0.06	0.11	.596	0.95	[0.77, 1.17]
Help study	-0.66	0.17	.000	0.52	[0.37, 0.73]
Experiment/see what like	0.41	0.26	.129	1.50	[0.89, 2.54]
Feel good/get high	-0.00	0.17	.994	1.00	[0.72, 1.39]
Increase/decrease effect of other drugs	-0.71	0.47	.140	0.49	[0.19, 1.27]
Some other reason	0.43	0.35	.225	1.53	[0.76, 3.09]
Misused, no motivation endorsed	-0.91	0.44	.043	0.41	[0.17, 0.97]
Did not misuse any substance	-1.36	0.05	.000	0.26	[0.23, 0.28]
<i>Past year major depressive episode vs. No past year major depressive episode<sup>c</sup></i>					
Intercept (Did not misuse this substance)	-0.21	0.06	.000	0.81	[0.72, 0.90]
Help lose weight	0.38	0.24	.118	1.46	[0.91, 2.35]

Model variables	B	SE	p	OR	95% CI <sub>OR</sub>
Help concentrate	-0.08	0.10	.465	0.93	[0.75, 1.14]
Help be alert or stay awake	-0.09	0.11	.425	0.92	[0.74, 1.14]
Help study	-0.45	0.17	.009	0.64	[0.46, 0.89]
Experiment/see what like	0.33	0.24	.172	1.39	[0.86, 2.22]
Feel good/get high	0.10	0.16	.528	1.11	[0.80, 1.54]
Increase/decrease effect of other drugs	-0.36	0.51	.486	0.70	[0.25, 1.95]
Some other reason	0.57	0.27	.038	1.77	[1.03, 3.04]
Misused, no motivation endorsed	-1.46	0.56	.012	0.23	[0.08, 0.71]
Did not misuse any substance	-1.09	0.05	.000	0.34	[0.31, 0.37]

*Past year serious thoughts of suicide vs. No past year serious thoughts of suicide<sup>d</sup>*

Intercept (Did not misuse this substance)	-0.56	0.07	.000	0.57	[0.50, 0.65]
Help lose weight	0.22	0.33	.514	1.25	[0.64, 2.43]
Help concentrate	-0.24	0.14	.090	0.79	[0.60, 1.04]
Help be alert or stay awake	-0.05	0.13	.696	0.95	[0.73, 1.23]
Help study	-0.69	0.14	.000	0.50	[0.38, 0.67]
Experiment/see what like	-0.02	0.26	.946	0.98	[0.58, 1.66]
Feel good/get high	0.20	0.17	.244	1.22	[0.87, 1.71]
Increase/decrease effect of other drugs	-0.70	0.42	.104	0.50	[0.21, 1.16]
Some other reason	0.41	0.34	.237	1.50	[0.76, 2.96]
Misused, no motivation endorsed	-0.64	0.43	.144	0.53	[0.22, 1.25]
Did not misuse any substance	-1.35	0.05	.000	0.26	[0.24, 0.29]

Note: Included age, sex, household income, population density, and race as covariates. Reference category = No misuse of this prescription drug.

<sup>a</sup>Model: Wald  $F(24, 27) = 155.38, p < .001, R^2 = .06$  (Cox & Snell), .09 (Nagelkerke).

<sup>b</sup>Model: Wald  $F(24, 27) = 87.50, p < .001, R^2 = .03$  (Cox & Snell), .10 (Nagelkerke).

<sup>c</sup>Model: Wald  $F(24, 27) = 177.76, p < .001, R^2 = .04$  (Cox & Snell), .09 (Nagelkerke).

<sup>d</sup>Model: Wald  $F(24, 27) = 84.54, p < .001, R^2 = .03$  (Cox & Snell), .09 (Nagelkerke).