PRESCRIPITION PAIN RELIEVER MISUSE AMONG US ADULTS WITH SERIOUS
PSYCHOLOGICAL DISTRESS

By: Keith Kwanghyun Lee
Bachelor of Science in Sports Management, New York University, 2019
Thesis Advisor: Courtney A. McKnight, MPH, DrPH
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Public Health
Department of Biostatistics
School of Global Public Health, New York University
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ABSTRACT

Introduction: Prescription pain relievers are the second most used illicit drug in the US, after marijuana use and misuse of prescription pain relievers (PPRM) can lead to serious health complications, such as overdose and death. There are significant gaps in our knowledge regarding the specific patterns of pain reliever usage among individuals with mental health disorders and understanding this complex relationship is essential for developing targeted interventions and optimizing treatment strategies.

Methods: US adults in the study were drawn from the 2021 National Survey on Drug Use and Health dataset (n=16,798). Both bivariate and multivariable logistic regression was conducted looking at PPRM and serious psychological distress, as a marker of mental health illnesses, among US adults, and examine other covariates.

Results: After adjusting for age, gender, race/ethnicity, income, education status, employment, depression, and use of mental health services or alcohol/drug treatment services, ever PPRM was associated with 1.50 increased odds of serious psychological distress in the past 30 days (CI: 1.35-1.68). Protective factors included male, increasing age, college education, and increasing income.

Conclusion: It is important to create accessible, tailored, and appropriate mental health services to cater to the needs of individuals experiencing serious psychological distress and potentially prevent or address comorbid PPRM. By addressing both mental health and substance misuse in a coordinated manner, healthcare providers and policymakers can work towards enhancing the well-being and quality of life of individuals dealing with serious psychological distress.

Key words: substance misuse, psychological distress, mental health

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INTRODUCTION

Prescription pain relievers, which include multiple types of drugs, such as codeine, hydrocodone, oxycodone, Dilaudid, methadone, morphine, as well as nonopioids, such as nonsteroidal anti-inflammatory agents (NSAIDs) and salicylates, play a critical role in managing acute and chronic pain, providing much-needed relief and enhancing quality of life for millions of individuals worldwide. Since the early 2000s, there has been a rapid uptick in nonmedical pain reliever use[1,2], also sometimes referred to as prescription pain reliever misuse (PPRM), resulting in overdoses and the well-known opioid epidemic. Misuse of prescription pain relievers, as defined by the National Survey on Drug Use and Health (NSDUH) and by the Substance Abuse and Mental Health Services Administration (SAMHSA) includes "(1) use without a prescription of the respondent's own; (2) use in greater amounts, more often, or longer than the respondent was told to take them; or (3) use in any other way a doctor did not direct the respondent to use them."[3] In 2019, prevalence of nonmedical prescription pain reliever use in the past year was 3.6% (9.7 million individuals) in the US[4] and prescription pain relievers are the most commonly used illicit drug in the US, after marijuana use.[3,5]

Misuse of prescription pain relivers can lead to addiction. Treatment for addiction to prescription pain relievers usually involves a combination of behavioral interventions, medication-assisted treatment (MAT), and supportive services. The goal of treatment is to help individuals reduce or cease PPRM, address underlying psychological factors, and improve overall well-being.[6-8] Cognitive-behavioral therapy when used to treat drug addiction focuses on helping patients develop coping strategies, enhance motivation for change, and build healthier behaviors. MAT[7] combines behavioral therapy with medications, such as methadone, buprenorphine, and naltrexone, that help reduce cravings, prevent withdrawal symptoms, and block the effects of opioids. Receiving treatment for PPRM is important due to the high risk of overdose. Overdose occurs when the amount of substance taken surpasses the body's ability to handle it, leading to respiratory depression, unconsciousness, and potentially death. Overdose often happens when individuals develop tolerance to substances, requiring larger amounts to achieve the desired effect, or when they are taken in concurrence with other substances, such as alcohol or benzodiazepines, which can amplify the depressant effects on the central nervous system, increasing the risk of overdose.[9] The risk of overdose underscores the critical importance of seeking timely and

appropriate treatment for PPRM.[10] MAT, behavioral interventions, and harm reduction strategies are all vital components of preventing overdose and helping individuals safely manage PPRM.

PPRM can lead to hospitalizations, emergency department visits, and other healthcare related costs due to increased medical problems in this population. From 2002 to 2012, PPRM resulted in nearly 15,000 deaths due to overdoses.[11] In 2018, as a result of PPRM and overdoses, there were approximately 1.5 million emergency department visits and 81,000 hospitalizations.[12] PPRM can also have effects on other individuals besides the user, such as neonatal abstinence syndrome – a condition among newborns due to withdrawal from intrauterine drug exposure affecting multiple organ system poor feeding and seizures, as well as long term neurodevelopmental outcomes.[13] Rates of neonatal abstinence syndrome have increased, from 1.5 per 1,000 hospital births in 2004 to 8.8 per 1,000 hospital births in 2017 (as per the most up to date literature), an increase of more than fivefold.[14] Direct health care costs of PPRM add up to $72.5 billion annually.[13,15] This figure does not take into account the indirect healthcare costs that individuals with PPRM have related to chronic diseases, many of which are the source of the pain that they are trying to address with prescription pain relievers, such as arthritis.[16,17]

In addition to the risk of overdose, emergency department visits, and treatment admissions[18], PPRM is concerning due to effects on cognitive impairment and associative risk-taking behaviors, such as alcohol and other drug use.[19-21] When misused, pain relievers can affect brain function and cognition, such as deficits in attention and working memory.[22] Impairments in these cognitive domains can significantly impact daily functioning, employment, and overall quality of life for individuals misusing these medications. Moreover, cognitive impairment may further exacerbate psychological distress, as individuals may struggle to cope with emotional challenges and make informed decisions regarding their well-being.[23] PPRM has been linked to impulsive behaviors and risk-taking tendencies, leading individuals to engage in hazardous activities that can have severe consequences.[24] The cognitive alterations induced by opioid misuse may contribute to impaired judgment and decreased inhibition, elevating the likelihood of participating in dangerous behaviors, such as driving under the influence or sharing needles.[24,25] Apart from the immediate health risks, prescription pain reliever misuse can have profound social and economic implications. The misuse of these medications can lead to impaired functioning at work, strained relationships, and legal issues related to the acquisition of drugs without proper prescriptions.[26] Additionally, the economic burden associated with healthcare costs, criminal

justice involvement, and lost productivity places a substantial strain on public resources, with total societal costs estimated to be $55.7 billion in 2007[27,28] and 1.5 trillion in 2020.[29]

PPRM continues to be a major public health concern, especially in the United States. There is an extensive literature examining lifespan changes in prevalence, motives, and overall correlates for use. Younger individuals, particularly adolescents and young adults are most likely to be at risk for PPRM.[30,31]The prevalence of lifetime PPRM among adolescents has been estimated to be 15% to 18%[32-34], with the average age of initiation at 17 years.[20] Most young adults who use PPRM do so for physical pain, rather than for recreational use.[35]After adolescence, there is a decline in PPRM prevalence with age, with some variability depending on medication class (e.g. lower rates of tranquilizer use compared to opioid use, and motives usually related to anxiety vs. pain relief with opioids) .[36,37] From 2015-2017, 256,000 adults over 50 years reported misuse of prescription pain relivers, the age group with the highest prevalence of PPRM after adolescents[38], with similar rates also found in more recent data.[38-40] In addition, PPRM is higher among males,[41-43] non-Hispanics Whites,[44,45] and individuals who misuse other substances (e.g. tobacco, marijuana, cocaine, and alcohol).[41] Data regarding PPRM by race has also shown differences by reasons for use, with higher rates of PPRM among non-Hispanic Blacks and Hispanics than non-Hispanic Whites for medical reasons, such as for helping with pain management.[46] In fact, in 2018 among adults misusing PPR, the most common reason was to relieve physical pain, followed by to "feel good" or "get high".[47]

Prior research has found that depression is a risk factor for PPRM, and usually precedes initiation of drug use.[48-50] For instance, Carra et al found that both adolescents and adults with major depression were more likely to report non-medical use of prescription pain relievers (RR 2.60 and 2.64, respectively), with a higher risk ratio among individuals not receiving treatment for their major depressive disorders than those receiving treatment.[51] There is limited research in how rates of PPRM vary by other types of mental illness, despite data that individuals with mental illness are three to four times more likely to have a substance use disorder than the general population.[52] Prior research regarding PPRM and generalized anxiety disorder has found the prevalence of anxiety in this population to be around 16% but also notes high rates of co-occurrence with chronic pain, suggesting that pain may be an independent risk factor.[53,54] Multiple different theories regarding schizophrenia and increased misuse of prescription drugs notes similar neurobiological pathways between the two[55,56], as well as the difficulty these patients may face in

finding appropriate and adequate treatment, resulting in worse outcomes in the form of more severe psychiatric symptoms and increased hospitalization rates.[57-59] In addition, when looking at US military personnel, those who had met criteria for posttraumatic stress disorder (PTSD) were at an increased risk for PPRM, which may have been in part due to high rates of comorbid chronic pain in this population, resulting in increased exposure and access to prescriptions for pain relievers.[60]

Despite the recognition of this complex interplay between mental health and substance use, there are significant gaps in our knowledge regarding the patterns of pain reliever usage among individuals with mental health disorders. The co-occurrence of mental illness and PPRM has significant implications for public health, clinical practice, and patient outcomes. Understanding the patterns behind pain reliever usage among individuals with mental health disorders is essential for developing targeted interventions and optimizing treatment strategies. The purpose of this study is to assess the association between PPRM and serious psychological distress among US adults and examine other covariates.

METHODS

The participants in this cross-sectional research study were drawn from the public use files of the 2021 National Survey on Drug Use and Health (NSDUH) dataset, which is a nationally representative survey of the noninstitutionalized US population looking at population estimates of substance use and health indicators. The NSDUH uses a multistage probability sampling design to ensure national representativeness. The Research Triangle Institute (RTI) Institutional Review Board (IRB) reviewed the NSDUH protocol, and all participants provided verbal informed consent for data collection, analysis, and publication. No further IRB approval was required since deidentified data from the public use dataset were obtained for analysis.

For this study, the sample was limited to adults aged 18 and older, which was decided upon given that the majority of the research regarding PPRM has been conducted among individuals under 18 years and young adults. Participants provided responses to selected questions as described below. The primary exposure of interest was serious psychological distress, which was measured using the Kessler-6 (K6) scale, a validated screening tool for psychological distress. Serious psychological distress includes mental health symptoms severe enough to cause moderate-to-severe impairment of daily functioning and require further intervention. The K6 scale consists of six items assessing the frequency of psychological symptoms (e.g. "nothing could cheer them

up", "nervous", "restless or fidgety", "hopeless", "that everything was an effort" and "worthless") experienced by individuals in the past 30 days. Responses were scored on a 5-point Likert scale ranging from 0 (none of the time) to 4 (all of the time) and overall scores ranging from 0 to 24, with higher scores indicating higher levels of psychological distress. Serious psychological distress was defined as a score of 13 or greater on the K6 scale.[61]

The substance use outcome of interest was ever misuse of prescription pain relievers ascertained via the question "Have you ever, even once, used any prescription pain reliever in any way a doctor did not direct you to use it?" with response choices yes or no. Covariates of interest included sex, race/ethnicity, income, age, education status, employment status, drug treatment, mental health treatment, and depression. Sex was dichotomized as male and female. Age was a categorical variable with the following levels: 12-17 years old, 18-25 years old, 26-34 years old, "5-49 years old and 50 or older. Individuals who answered 12-17 years old were omitted from analysis. Race and ethnicity were combined into a variable with categories Non-Hispanic White, Non-Hispanic Black/African American, Non-Hispanic Native American/AK Native, Non-Hispanic Asian, Non-Hispanic more than one race and Hispanic. Education categories were less high school, high school graduate, some college/associate degree, and college graduate. Total family income categories were less than $20,000, $20,000-$49,000, $50,000-$74,999 and $75,000 or more. Employment status options included employed full time, employed part time, and unemployed. An additional variable of interest that was included was use of drug treatment or counseling as defined by the question "Have you ever received treatment or counseling for your use of alcohol or any drug, not counting cigarettes?" with response choices yes or no. Utilization of mental health services in the past year, both in-person outpatient and virtual, was also included in analyses. This was defined by the question "During the past 12 months have you received any professional counseling, medication or treatment for your mental health, emotions, or behavior over the phone, by email, or through video calling?" with response choices yes or no. Depression was measured by the presence of a lifetime major depressive episode in adulthood with response choices yes or no.

Analyses were performed using STATA MP (StateCorp, College Station, TX, US) and included Chi-squared tests and multivariable logistic regression models. Unweighted data were used. Unadjusted as well as adjusted odds ratios and corresponding 95% confidence intervals were

reported for ever PPRM with subsequent multivariable logistic regression models to assess the association with socioeconomic and other sociodemographic covariates.

After excluding cases for missing data for any study variable, a final sample of 16,798 US adults from the 2021 NSDUH was used for this analysis.

RESULTS

Table 1 depicts the characteristics of all study participants. The sample included 65.2% females and 34.8% males. The majority of participants (83.2%) were under 50 years of age. The racial/ethnic distribution was 65.5% Non-Hispanic (NH) White, 8.9% NH Black, 1.2% NH Native American or Pacific Islander, 5.0% NH Asian, 4.5% NH identifying as other races of ethnicities, and 14.9% Hispanic. In terms of annual household income, 7.0% reported earning less than $20,000, 19.2% reported earning between $20,000 and $49,999, 32.4% reported earning between $50,000 and $74,999, and 41.5% reported earning $75,000 or more. Educational attainment varied, with the majority of participants being a high school graduate or higher. Most participants (49.3%) were also employed full-time. In addition, 38.5% of participants reported experiencing at least one major depressive episode in their lifetime. Sixteen percent reported receiving mental health services at some point in their lifetime. Another 7.8% of participants reported ever receiving treatment for alcohol or drug use. Lastly, 7,138 participants (42.5%) met the criteria for serious psychological distress based on the K6 criteria and 2,309 (13.8%) reported ever PPRM.

Table 2 depicts the characteristics of participants dichotomized by serious psychological distress in the past 30 days. Those who reported serious psychological distress were more likely to be female (p<0.001), 18-25 years old (p<0.001), Hispanic (p<0.001), have a household income <$20,000 (p<0.001), less than high school education(p<0.001), be unemployed (p<0.001), experience at least one major depressive episode in their lifetime (p<0.001), ever receive mental health services (p<0.001), ever receive treatment for alcohol or drug use (p<0.001), and report ever PPRM (p<0.001). Table 3 depicts the characteristics of participants in the group dichotomized by ever misuse of prescription pain relievers. "Those who reported ever PPRM were more likely to be female (p<0.001), 35-49 years of age (p<0.001), Non-Hispanic White (p<0.001), have a household income <$20,000 (p<0.001), high school education (p<0.001), be unemployed (p<0.001), experience at least one major depressive episode in their lifetime (p<0.001), ever

receive mental health services (p<0.001), ever receive treatment for alcohol or drug use (p<0.001), and report ever PPRM (p<0.001).

In the multiple logistic regression analysis, we examined the association between ever PPRM and serious psychological distress while controlling for demographic and socioeconomic factors (Table 4). In unadjusted analysis, the odds of having serious psychological distress in the past 30 days was 19% lower in males as compared to females (CI: 0.76-0.86). males had 0.81 decreased odds of having serious psychological distress in the past 30 days, as compared to females An inverse relationship was noted between age and recent serious psychological distress, such that the odds of having serious psychological distress in the past 30 days was 84% lower in participants 50 years and older compared to 18-25 year old (CI: 0.14-0.18). A similar inverse relationship was noted with regards to income, such that the odds of having serious psychological distress in the past 30 days was 56% lower in participants with an income of $75,000 or greater compared to those reporting incomes <$20,000. Non-Hispanic Native American/Pacific Islanders (OR 1.61, CI: 1.21-2.13), Non-Hispanic Multiracial (OR 1.58, CI: 1.36-1.83), and Hispanic (OR 1.20, CI: 1.10-1.31) participants were all more likely to report recent serious psychological distress than NH White participants. Being a college graduate was a strong protective factor for recent serious psychological distress, decreasing the likelihood by almost half (OR 0.54, CI: 0.48-0.61). In unadjusted analysis, depression was the strongest risk factor for recent serious psychological distress with an increased odds of 7.37 (CI: 6.87-7.90). Past year use of mental health services was associated with a 3.04 (CI: 2.80-3.31) increased odds and ever having received treatment for alcohol or drug use was associated with 1.77 increased odds (CI: 1.57-1.98) of recent serious psychological distress. Additionally, in unadjusted analysis, ever PPRM was associated with 1.90 increased odds of serious psychological distress in the past 30 days (CI: 1.74-2.08) compared to those who did not report serious psychological distress.

After adjusting for gender, age, race/ethnicity, income, education status, employment, depression, and use of mental health services or alcohol/drug treatment services, ever PPRM was associated with 1.50 increased odds of serious psychological distress in the past 30 days (CI: 1.35-1.68). In adjusted analysis, males were 14% less likely than females to report serious psychological distress (CI: 0.80-0.93). The inverse relationship between recent serious psychological distress and age, as well as income persisted in the adjusted model, such that the odds of having serious psychological distress in the past 30 days was 82% lower in participants 50 years and older

compared to 18-25 year old (CI: 0.16-0.21) and 31% lower in participants with an income of $75,000 or greater compared to those reporting incomes <$20,000 (CI: 0.61-0.77). In adjusted analysis, many of the aforementioned associations between race and serious psychological distress were no longer statistically significant, except that Non-Hispanic Black participants continued to have a decreased odds of serious psychological distress, compared to Non-Hispanic White participants (OR 0.78, CI: 0.68-0.89).

Being a college graduate continued to be a strong protective factor for recent serious psychological distress, decreasing the likelihood by over one-third (OR 0.65, CI: 0.55-0.76) compared to those with less than high school education. Being a college graduate was a strong protective factor for recent serious psychological distress, decreasing the likelihood by 35% (CI: 0.55-0.86). Depression was still the strongest risk factor for recent serious psychological distress with an increased odds of 6.14 (CI: 5.71-6.63). Past year use of mental health services was associated with a two-fold (CI: 2.00-2.42) increased odds and ever received treatment for alcohol or drug use was associated with an 1.34 increased odds (CI: 1.16-1.55) of recent serious psychological distress.

DISCUSSION

Overall, these results have important implications for understanding the complex interplay between mental health issues and substance misuse, and they shed light on the potential need for integrated interventions to address both aspects of individuals' well-being. It is important to note that our finding of a strong relationship between PPRM misuse and serious psychological distress aligns with a growing body of research exploring the complex relationship between substance misuse and mental health, as further explained below[53,54]

The most notable protective factors against serious psychological distress in this study were older age, higher income, and non-White race/ethnicity. These findings are consistent with prior studies[62,63], as well as overall trends for opioid use being largely concentrated in low income and majority white communities in the US. Collectively these findings reaffirm that interventions should target low-income and Non-Hispanic White communities. Prior studies[64,65] note that high rates of PPRM among those between 50 and 64 years suggest that PPRM may become a large problem as individuals age; thus suggesting that older individuals should be a priority in public

health interventions seeking to reduce PPRM. This study, which found an inverse association between age and PPRM, such that those between 18 and 25 were at the highest risk (Table 4.

In this study, ever PPRM was reported by 13.8% of participants, which is lower than prior estimates of 29% and 8-12% risk of developing a use disorder[66], but discrepancies may be secondary to differences in data measurement. For example, in 2020, Czeisler et al. conducted web-based surveys and assessed new PPRM within the context of the COVID-19 pandemic. and found elevated levels of mental health conditions and substance use rates of 13.3%. Other studies examining at PPRM used a past year timeframe, which may account for why they found a lower prevalence of PPRM (4.1-16.3%) than this study [67,68]. Further these studies included participants aged 12-17 in their sample, which may also account for the lower prevalence of PPRM.[67,68] Jordan et al. 2017 conducted a meta-analysis of past year PPRM among participants 11-30 years of age, and reported a prevalence of 0.7%-16.3%.

In addition, this study also noted a strong association between depression and serious psychological distress, which makes sense given the similarities between the two variables, but also calls to attention the increased risk of multiple mental health illnesses compounding upon one another. Given different questionnaires and cut-offs for diagnosis for the depression and serious psychological distress, many studies do not look at both conditions and only focus on one.[69] Prior estimates of serious psychological distress prevalence among US adults is 3.3%[61], but much higher rates were found in this study with rates of 15.9% among individuals without ever PPRM and 22.4% in individuals with ever PPRM. The prevalence of serious psychological distress in the overall sample was 42.5%. This may have been due to exclusion bias, as participants who did not respond to all six questions for the K6 or responded with "don't know" or "refuse" were thus excluded from the calculation. It is important to note that these are more recent rates of serious psychological distress that may reflect mental health during the COVID-19 pandemic.

In this study, serious psychological distress was strongly associated with both past year use of mental health services and ever use of alcohol or drug treatment. Unfortunately, given this was a cross-sectional study, we are unable to assess temporality to clarify the relationship between serious psychological distress and utilization of resources. Other studies have noted similarly high rates of mental health services utilization, ranging from 38-52%, among individuals with serious psychological distress[70-72], while other have noted that there may be differences by ethnicity given cultural stigma.[73] When looking more so at alcohol and drug treatment interventions, few studies

have directly looked at that and serious psychological distress[74], although there are reports of high rates of mental health problems among patients receiving such services[75], which may point to the diverse treatment needs in addressing co-occurring problems.

LIMITATIONS AND STRENGTHS

Several limitations should be considered when interpreting the findings. Firstly, the cross-sectional nature of the NSDUH data limits the ability to establish causality. Since data were collected at a single time point, the temporal sequence between PPRM and serious psychological distress cannot be determined. It is plausible that both factors may influence each other bidirectionally, and other unmeasured variables might contribute to the observed associations. Longitudinal studies are necessary to explore the potential causal relationships between these variables over time. Secondly, data was self-reported and thus introduces the possibility of recall bias and social desirability bias. Participants may underreport or overreport PPRM or psychological distress due to memory limitations or concerns about stigma. This also relates to self-report of receiving mental health services or treatment for alcohol or drug use. Younger age, in particular adolescence, is a significant predictor for PPRM[76], however, given that the majority of literature on PPRM is among this age bracket, they were excluded from this study in order to explore the gap in the literature regarding PPRM use among adults. Nevertheless, this limitation does not diminish the importance of public health interventions in targeting younger populations as well. In addition, this study assessed factors associated with ever PPRM. Examining "ever" misuse may lack precision in capturing the recent patterns of misuse. The study might not capture variations in intensity, frequency, or duration of misuse, which could be relevant when exploring associations with serious psychological distress, as well as how those trends have changed with time. Most importantly, understanding "ever" misuse might not be as clinically relevant as understanding recent misuse. Recent misuse might more directly influence current health outcomes and treatment needs.

The NSDUH survey has limited data on the specific types of nonmedical pain relievers used, which limits understanding of the potential variations in usage patterns and associated risks when looking at opioids versus NSAIDs for example. This may be helpful given that the overwhelming majority of research looking at PPRM is focused on opioid use and little is known about non-opioid PPRM. This study uses data from 2021, which despite being the most recent data

available, was also conducted during the COVID-19 pandemic, which is known to have had significant impacts on physical and mental health, such as increased substance use and initiation, anxiety, and depression.[66,77,78] As a result, the generalizability of these results in the years after the pandemic may be limited. For example, there are theories that women had an increased risk of depression during the pandemic due to increased stressors related to the closures of schools and daycare facilities and separation and isolation from community groups[79-81], which may have contributed to our findings that females had an increased risk of serious psychological distress in both Model 1 and 2.

Despite these limitations, this study provides valuable insights that are nationally representative into the association between PPRM and serious psychological distress. Our findings highlight the need for targeted interventions for individuals most vulnerable to severe psychological distress and PPRM and further investigation into this complex relationship between the two. Future research may be strengthened by using more objective measures such as medical records or toxicology results to corroborate self-reported data, enhance accuracy of findings, and better delineate temporality of PPRM and severe psychological distress. Longitudinal studies in particular would be beneficial in establishing causal relationships to better understand the dynamic interactions between serious psychological distress, mental health service utilization and the interplay of PPRM as well as substance use treatment. Given the knowledge that most individuals with PPRM use prescription pain relievers to manage pain, which may be chronic, future studies should examine prescription pain reliever use among adults with chronic pain, as well as those that experience chronic pain that limits work and life activities versus those with chronic pain that does not limit daily activities, to provide further insights about how these medications are used for pain.

Overall, these results contribute to our understanding of the associations between serious psychological distress and substance misuse and mental health service utilization, highlighting the potential areas for targeted interventions and support for individuals experiencing mental health challenges. Individuals with serious psychological distress may be more inclined to seek or be referred to mental health services or substance use treatment.[87] This highlights the importance of providing accessible, tailored, and appropriate mental health services to cater to the needs of individuals experiencing serious psychological distress and potentially prevent or address comorbid PPRM. The National Academy of Science developed a Committee on Pain Management and Regulatory Strategies to Address Prescription Opioid Abuse to review evidence on current

interventions.[88] Major recommendations included: an education program to raise awareness about effective pain management, increased access to substance use treatment programs, and improving education about treatment among healthcare providers. By addressing both mental health and substance misuse in a coordinated manner, healthcare providers and policymakers can work towards enhancing the well-being and quality of life of individuals dealing with serious psychological distress.

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Tables and Figures

Table 1: Characteristics of the sample (n=16,798)

Variable	N (%)
Sex	
Male	5,847 (34.8)
Female	10,951 (65.2)
Age	
18 - 25	5,806 (34.6)
26 - 34	3,743 (22.3)
35 - 49	4,424 (26.3)
50 +	2,825 (16.8)
Race	
NH White	11,004 (65.5)
NH Black	1,497 (8.9)
NH Native American/Pacific Islander	200 (1.2)
NH Asian	838 (5.0)
NH Multiracial	764 (4.6)
Hispanic	2,495 (14.9)
Income	
<$20,000	3,018 (18.0)
$20,000 - $49,999	4,532 (27.0)
$50,000 - $74,999	2,479 (14.8)
$75,000 +	6,769 (40.3)
Education status	
Less high school	1,171 (7.0)
High school graduate	3,213 (19.1)
Some college	5,440 (32.4)
College graduate	6,974 (41.5)
Employment	
Full time	8,280 (49.3)
Part time	2,992 (17.8)

Prescription pain reliever misuse among US adults with serious psychological distress

Unemployed	5,526 (32.9)
Depression	6,465 (38.5)
Past year use of mental health services	2,827 (16.8)
Ever receive alcohol or drug treatment	1,296 (7.7)
Serious psychological distress – past 30 days	7,138 (42.5)
Ever misuse of prescription pain relievers	2,309 (13.8)

Table 2: Characteristics of the sample by serious psychological distress in the past 30 days (n=16,798)

Variable	Serious psychological distress in the past 30 days ^ N (%)		
	Yes (n=7,138)	No (n=9,660)	p-value
Sex			<0.001**
Male	2,289 (32.1)	3,558 (36.8)	
Female	4,849 (67.9)	6,102 (63.2)	
Age			<0.001**
18 - 25	3,348 (46.9)	2,458 (25.4)	
26 - 34	1,734 (24.3)	2,009 (20.8)	
35 - 49	1,545 (21.6)	2,879 (29.8)	
50 +	511 (7.2)	2,314 (24.0)	
Race			<0.001**
NH White	4,586 (64.3)	6,418 (66.4)	
NH Black	567 (7.9)	930 (9.6)	
NH Native American/Pacific Islander	107 (1.5)	93 (1.0)	
NH Asian	323 (4.5)	515 (5.3)	
NH Multiracial	405 (5.7)	359 (3.7)	
Hispanic	1,150 (16.1)	1,345 (13.9)	
Income			<0.001**
<$20,000	1,634 (22.9)	1,384 (14.3)	
$20,000 - $49,999	2,166 (30.3)	2,366 (24.5)	
$50,000 - $74,999	1,009 (14.1)	1,470 (15.2)	
$75,000 +	2,329 (32.6)	4,440 (46.0)	
Education status			<0.001**
Less high school	569 (7.8)	602 (6.2)	
High school graduate	1,554 (21.8)	1,659 (17.2)	
Some college	2,651 (37.1)	2,789 (28.9)	
College graduate	2,364 (33.1)	4,610 (47.7)	

Employment			<0.001**
Full time	3,273 (45.9)	5,007 (51.8)	
Part time	1,450 (20.3)	1,542 (16.0)	
Unemployed	2,415 (33.8)	3,111 (32.2)	
Depression	4,578 (64.1)	1,887 (19.5)	<0.001**
Past year use of mental health services	1,838 (25.8)	989 (10.2)	<0.001**
Ever receive alcohol or drug treatment	719 (10.1)	577 (6.0)	<0.001**
Ever misuse of prescription pain relievers	518 (18.3)	1,791 (12.8)	<0.001**

*p<0.05 **p<0.001

Table 3: Characteristics of the sample by misuse of prescription pain relievers (n=16,798)

Variable	Ever misuse of prescription pain relievers ^ N (%)		
	Yes (n=2,309)	No (n=14,489)	p-value
Sex			<0.001**
Male	891 (38.6)	4,956 (34.2)	
Female	1,418 (61.4)	9,533 (65.8)	
Age			<0.001**
18 - 25	553 (24.0)	5,251 (36.3)	
26 - 34	674 (29.2)	3,069 (21.2)	
35 - 49	764 (33.1)	3,660 (25.3)	
50 +	318 (13.8)	2,507 (17.3)	
Race			<0.001**
NH White	1,675 (72.5)	9,329 (64.4)	
NH Black	134 (5.8)	1,363 (9.4)	
NH Native	39 (1.7)	161 (1.1)	
American/Pacific Islander			
NH Asian	42 (1.8)	796 (5.5)	
NH Multiracial	137 (5.9)	627 (4.3)	
Hispanic	282 (12.2)	2,213 (15.3)	
Income			<0.001**
<$20,000	448 (19.4)	2,570 (17.7)	
$20,000 - $49,999	662 (28.7)	3,870 (26.7)	
$50,000 - $74,999	383 (16.6)	2,096 (14.5)	
$75,000 +	816 (35.3)	5,953 (41.1)	
Education status			0.002*
Less high school	161 (7.0)	1,010 (7.0)	
High school graduate	483 (20.9)	2,730 (18.8)	
Some college	786 (34.0)	4,654 (32.1)	
College graduate	879 (38.1)	6,095 (42.1)	
Employment			<0.001**

Prescription pain reliever misuse among US adults with serious psychological distress

Full time	1,129 (48.9)	7,151 (49.4)	
Part time	380 (16.5)	2,612 (18.0)	
Unemployed	800 (34.7)	4,726 (32.6)	
Depression	1,232 (53.4)	5,233 (36.1)	<0.001**
Past year use of mental health services	518 (22.4)	2,309 (15.9)	<0.001**
Ever receive alcohol or drug treatment	604 (26.2)	692 (4.8)	<0.001**
Serious psychological distress – past 30 days	518 (22.4)	2,309 (15.9)	<0.001**

*p<0.05 **p<0.001

Table 4: Logistic regression results predicting serious psychological distress in the past 30 days (n=16,798)

Variable	Unadjusted OR	CI	Adjusted OR	CI
Ever misuse of prescription pain relievers	1.90**	(1.74, 2.08)	1.50**	(1.35, 1.68)
Male sex	0.81**	(0.76, 0.86)	0.86**	(0.80, 0.93)
Age				
18 - 25	Ref	Ref	Ref	Ref
26 - 34	0.63**	(0.58, 0.69)	0.70**	(0.64, 0.78)
35 - 49	0.39**	(0.36, 0.43)	0.44 **	(0.39, 0.48)
50 +	0.16**	(0.14, 0.18)	0.18 **	(0.16, 0.21)
Race				
NH White	Ref	Ref	Ref	Ref
NH Black	0.85*	(0.76, 0.95)	0.78**	(0.68, 0.89)
NH Native American/Pacific Islander	1.61*	(1.21, 2.13)	1.21	(0.88, 1.69)
NH Asian	0.88	(0.76, 1.01)	1.02	(0.86, 1.21)
NH Multiracial	1.58**	(1.36, 1.83)	1.05	(0.88, 1.25)
Hispanic	1.20**	(1.10, 1.310)	0.93	(0.84, 1.03)
Income				
<$20,000	Ref	Ref	Ref	Ref
$20,000 - $49,999	0.78**	(0.71, 0.85)	0.89*	(0.80, 0.99)
$50,000 - $74,999	0.58**	(0.52, 0.65)	0.72**	(0.63, 0.82)
$75,000 +	0.44**	(0.41, 0.48)	0.69**	(0.61, 0.77)
Education status				
Less high school	Ref	Ref	Ref	Ref
High school graduate	0.99	(0.87, 1.13)	0.93	(0.80, 1.09)
Some college	1.01	(0.89, 1.14)	0.90	(0.77, 1.04)
College graduate	0.54**	(0.48, 0.61)	0.65**	(0.55, 0.76)

Employment				
Full time	Ref	Ref	Ref	Ref
Part time	1.40**	(1.29, 1.51)	0.99	(0.90, 1.10)
Unemployed	1.62**	(1.43, 1.84)	1.17 *	(1.00, 1.36)
Depression	7.37**	(6.87, 7.90)	6.14**	(5.71, 6.63)
Past year use of mental health services	3.04**	(2.80, 3.31)	2.20**	(2.00, 2.42)
Ever receive alcohol or drug treatment	1.77**	(1.57, 1.98)	1.34**	(1.16, 1.55)

*p<0.05 **p<0.001