UMURJ
University of Michigan Undergraduate Research Journal

Confronting Two Crises: The Effect of Mental Health Disorders on Opioid Use

ISABEL ZHANG

Previous studies have shown an overlap between opioid misuse and mental health. One theory that explains the relationship between mental health and opioid addiction is that people with depression and other mental health conditions may self-medicate with opioids to alleviate their symptoms. To address this question, I used data from the 2020 National Health Interview Survey to examine the effect of anxiety and depression on opioid use in the past year. I used logistic regression models with estimated odds ratios and controlled for race, sex, and age. Overall, I found that depression level, anxiety level, anxiety frequency, and taking medication for anxiety significantly affected opioid use in the past twelve months. As expected, higher levels of anxiety and depression correlated with increased opioid medication use. However, the correlation between anxiety and depression indicates that respondents who took medication for depression and anxiety were more likely to have used opioids in the past year. This result thus contradicts the hypothesis that people with depression and other mental health conditions may inappropriately self-medicate with opioids to alleviate their symptoms.

Key words
public health, opioids, mental health, health policy

Introduction

The United States is in an opioid crisis that has worsened since the onset of the Coronavirus. Drug overdose deaths reached a record high of 93,331 in 2020. In 2015, opioids were involved in only 18 percent of all overdose deaths; in 2020, over 60 percent of deaths were at least partially attributable to synthetic

Contact: Isabel Zhang <izzyzhan@sas.upenn.edu>

opioid use.[1] The pandemic may have exacerbated the opioid epidemic by worsening mental health. Stressful features of the pandemic —such as the loss of jobs, limited social interactions, and anxiety about contracting COVID— have negatively impacted mental health and created new barriers for people already suffering from mental illness and substance use disorders. Indeed, during the pandemic, about four in ten adults in the U.S. have reported symptoms of anxiety or depressive disorder, up from one in ten adults who reported these symptoms in 2019.[2]

Previous studies have shown an overlap between opioid use and mental illness. For example, Davis et al. found that people who have a mental health condition, such as depression or anxiety, are more likely to get opioid prescriptions and are at a greater risk of misusing opioids. The study also found that adults in the United States who have a mental health condition receive more than half of all opioid prescriptions, even though they comprise only sixteen percent of the population.[3] Moreover, compared with people without depression, participants with severe depression are 14.66 times more likely to misuse opioids.[4]

The widespread misuse of and addiction to opioids has profound implications. The estimated economic loss from opioid abuse in the United States is $78.5 billion a year, including healthcare costs, lost productivity, addiction treatment, and criminal justice involvement.[5] Yet despite increases in the prevalence of mental health disorders and opioid misuse, the relationship between these two national crises has not been thoroughly researched.

Researchers have developed multiple theories to explain the relationship between mental health and opioid addiction. This paper focuses on the theory that people with depression and other mental health conditions may self-medicate with opioids to alleviate their symptoms. Specifically, I am interested in whether the severity of mental illness and medication treatment for these disorders impacts opioid use. To address this question, I used data from the 2020 National Health Interview Survey to examine the effect of anxiety and

1. Jesse C. Baumgartner and David Radley, "The Drug Overdose Toll in 2020 and Near-Term Actions for Addressing It," Commonwealth Fund, last modified August 16, 2021, https://www.commonwealthfund.org/blog/2021/drug-overdose-toll-2020-and-near-term-actions-addressing-it.

2. Kaiser Family Foundation, last modified February 10, 2021, https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/.

3. Matthew Davis et al., "Prescription Opioid Use among Adults with Mental Health Disorders in the United States," *JABFM*, 1, https://www.jabfm.org/content/30/4/407.

4. Daniel Feingold, Silviu Brill, and Itay Goor-Aryeh, "The Association Between Severity of Depression and Prescription Opioid Misuse among Chronic Pain Patients with and without Anxiety: A cross-sectional study" [1], *National Library of Medicine*, 1, https://pubmed.ncbi.nlm.nih.gov/29660645/.

5. National Institutes of Health, "Opioid Overdose Crisis," National Institute on Drug Abuse, https://www.drugabuse.gov/drug-topics/opioids/opioid-overdose-crisis.

depression on opioid use. I chose to focus on anxiety and depression, as these are the predominant mental health disorders among adults in the United States. My hypothesis that people with depression and anxiety would be associated with opioid use, but that this association would be weaker for people who take medication for their depression/anxiety. Indeed, the results showed that depression level, anxiety level, and medication use for anxiety and depression significantly affected opioid use in the past twelve months, suggesting a crucial overlap between these two national crises.

Methods

This study used data from the 2020 National Health Interview Survey (NHIS), a cross-sectional household interview survey of the United States civilian non-institutionalized population. This survey uses geographically clustered sampling techniques to select a nationally representative sample. It collects data on a broad range of health topics, including substance use and mental health care. People excluded from the interview are those with no fixed household address, people in long-term care institutions, active-duty military personnel, people in correctional facilities, and citizens living in foreign countries. Due to the pandemic, the NHIS shifted from in-person to telephone interviewing starting in late March.[6]

The dependent variable of interest in this paper was opioid use in the past twelve months. The independent variables were depression level, anxiety level, medication use for anxiety, and medication use for depression. I used logistic regression models with estimated odds ratios to test the correlation between the independent variables and opioid use. I chose a significance level of 0.05 and controlled for race, sex, and age. I used the statistical computing package R in all regressions and statistical analyses.

Results

All four variables—depression level, taking medication to treat depression, anxiety level, and taking medication to treat anxiety—had a statistically significant effect on opioid use in the past twelve months. Relative to respondents who reported feeling "a little" depressed, respondents who said they had "a lot" of depression were more likely to have used opioids within the past year by a factor of 1.609 ($p < 0.001$). As shown in figure one, respondents who reported feeling a

6. Centers for Disease Control and Prevention, "About the National Health Interview Survey," National Center for Health Statistics, https://www.cdc.gov/nchs/nhis/about_nhis.htm.

Variable	Estimate (Odds Ratio)	Standard Error	z value	p > [z]
Depression Level: A Lot	1.609037	0.076581	6.211	1.37E-07
Does Not Take Medication for Depression	-0.8469421	0.062508	-2.658	0.00787
Anxiety Level: A Lot	1.070889	0.068489	5.71	1.13E-08
Does Not Take Medication for Anxiety	-0.178333	0.057802	-3.391	0.000697

Table 1: Effect of Depression and Anxiety on Opioid Use in the Past 12 Months

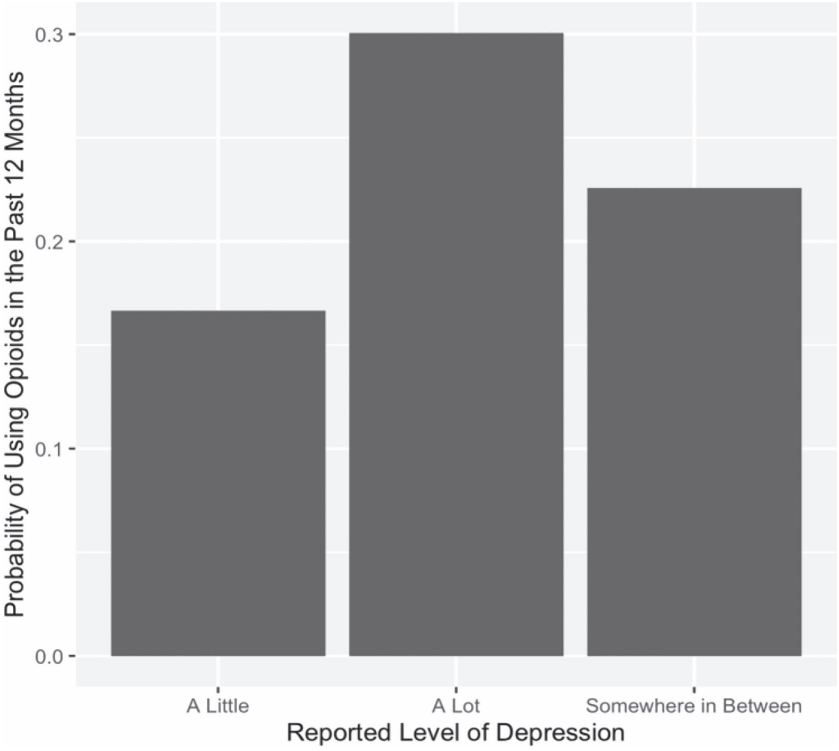

Figure 1: The Effect of Depression Level on the Probability of Using Opioids in the Past Year

little depressed had a 16.7% probability of using opioids, while participants who reported feeling a lot of depression had a 30.4% probability of using opioids. Similarly, respondents who reported feeling "a lot" of anxiety were more likely to have used opioids in the past year by a factor of 1.071 (p = 0.008).

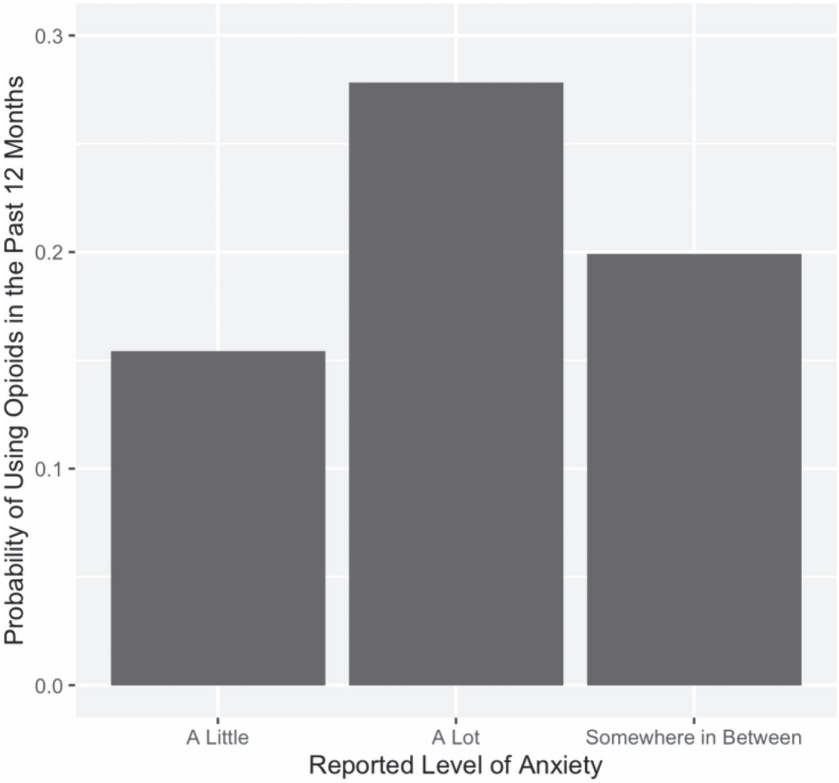

Figure 2: The Effect of Anxiety Level on the Probability of Using Opioids in the Past Year

There was also a significant correlation between whether a respondent took prescription medication for anxiety or depression and opioid use. Compared to people who did take medication for depression, the effect of not taking medication for depression decreased the likelihood of using opioids by a factor of 0.847 ($p < 0.001$). Figure three shows that people who took medication to treat their depression had a 15.3% probability of using opioids, while people who did not take medication had a 25.7% probability of opioid use. Similarly, people who did take medication for anxiety were less likely to use opioids by a factor of 0.178, relative to respondents who did take medication for anxiety ($p < 0.001$).

Discussion

Overall, this study showed that depression level, anxiety level, anxiety frequency, and taking medication for anxiety significantly affected opioid use in the past twelve months. As expected, higher levels of anxiety and depression correlated

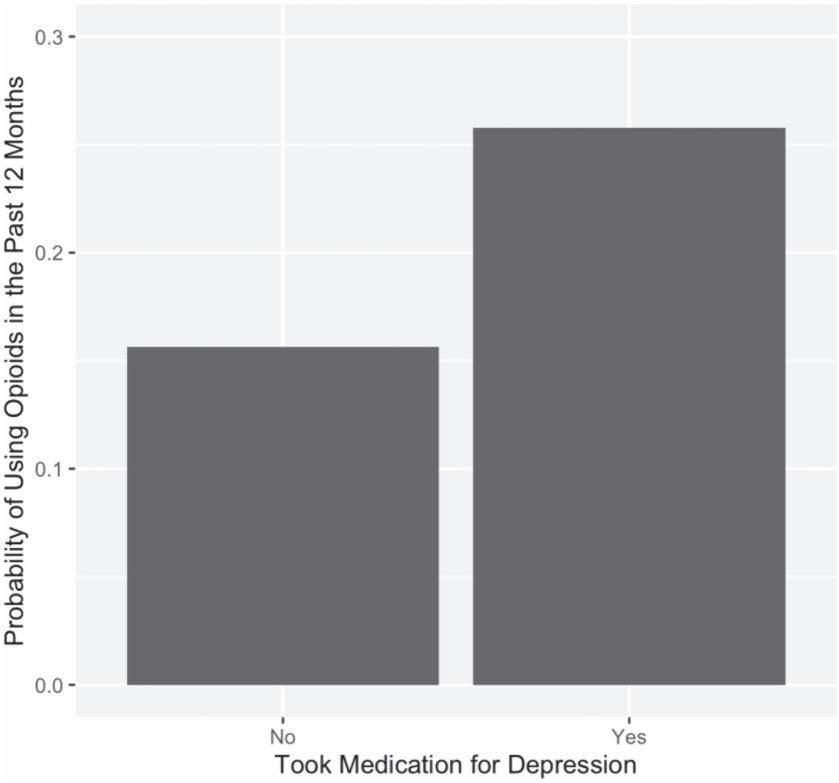

Figure 3: The Effect of Taking Prescription Medication for Depression on the Probability of Using Opioids in the Past Year

with increased opioid medication use. This finding is consistent with previous studies, which have shown that anxiety and depressive disorders can predict increased substance use disorders and higher relapse rates following substance abuse treatment.[7] The fact that the odds ratio for depression level (1.609) was higher than that of anxiety level (1.071) suggests that depression may indicate more proclivity to engage in substance use than anxiety. Indeed, Mohammed et al. found slightly higher substance use rates among depression than anxiety patients.[8] However, these findings may be due to multicollinearity between depression and anxiety, as common risk factors influence the development of both disorders.

7. Ikram Mohamed et al., "Assessment of Anxiety and Depression among Substance Use Disorder Patients: A Case-control Study," *Middle East Current Psychiatry*, 2020, 1, accessed June 3, 2020, https://mecp.springeropen.com/articles/10.1186/s43045-020-00029-w.

8. Mohamed et al., "Assessment of Anxiety," 1.

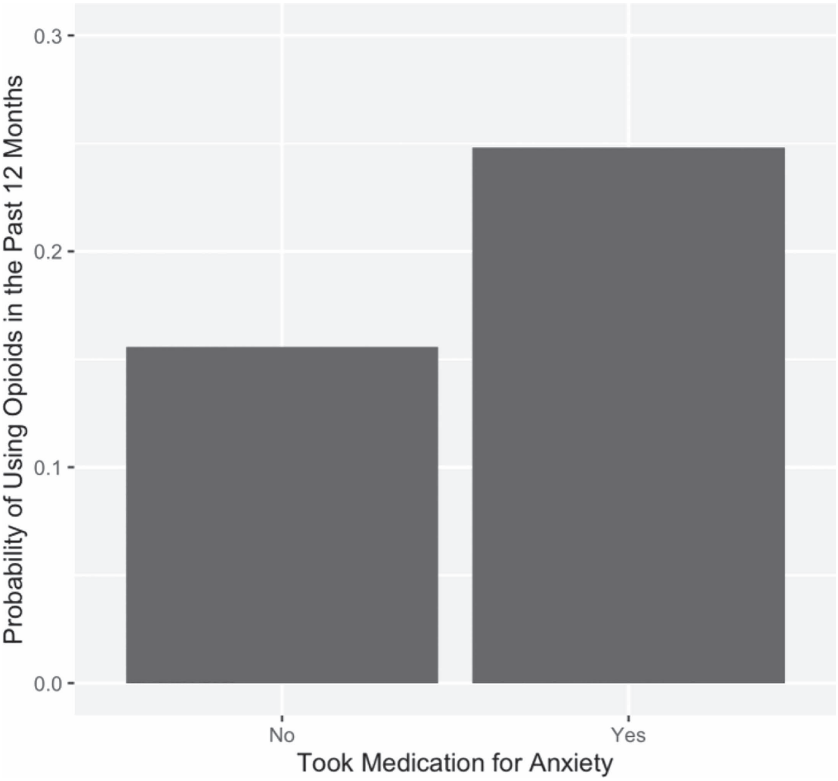

Figure 4: The Effect of Taking Prescription Medication for Anxiety on the Probability of Using Opioids in the Past Year

Moreover, the negative odds ratios between anxiety and depression indicate that respondents who took medication for depression and anxiety were more likely to have used opioids in the past year. This result contradicts my hypothesis that people with depression and other mental health conditions may self-medicate with opioids to alleviate their symptoms. One explanation for this finding is that patients with medication prescriptions may have more severe conditions, leading to increased opioid use. Another explanation is that respondents who used prescription medications may be more comfortable with engaging with different kinds of substances in general. However, patients with medications also have more contact with the health care system, which should mean more screening and support for substance use disorders. This result thus indicates that mental health services may be inadequate in addressing patient needs.

Nevertheless, other theories besides the self-medication hypothesis may explain the correlation between mental health disorders and substance theories. One theory is that common risk factors, such as genetic and environmental vulnerabilities, can contribute to both mental illness and substance use and

addiction. An additional theory is that pain may be a common comorbidity for people with mental health conditions. Depression and anxiety may cause individuals to feel pain more acutely or be less able to cope with it, leading them to use opioids to numb the pain.[9]

Limitations

This study has several limitations. First, I used cross-sectional, observational data from the NHIS. This data is not based on a randomized, controlled experiment design and thus does not demonstrate a causal relationship between having a mental health disorder and opioid use. As a result, the regression does not eliminate the possibility of reverse causality. Indeed, previous studies have suggested that opioid use can exacerbate symptoms of a mental illness. For example, Scherrer et al. found a positive association between the length of time a patient uses opioids and their risk of developing depression. Between 8.4 and 11.6 percent of people who used opioids for 1 to 30 days developed depression within the 12 months following their opioid use.[10] More research is needed to clarify the relationship between mental health disorders and prescription opioid use.

Additionally, this study investigated the relationship between mental health disorders and opioid use among noninstitutionalized adults in the United States. Consequently, the findings are not generalizable to children, teenagers, and institutionalized adults. Lastly, the NHIS data is self-reported by patients, which may potentially cause inaccuracies. Previous studies suggest that survey respondents vary considerably in their willingness to provide accurate answers to questions regarding substance use behaviors and may underreport their drug use.[11] Moreover, the self-reported assessment of anxiety and depression level only consisted of three categories (a little, a lot, and in between), which is less rigorous than the outcomes used in other questionnaires —such as the PHQ-9 and GAD-7— and may therefore reflect a measurement error. Despite these limitations, this study sheds light on the relationship between mental health, pain,

9. National Institutes of Health, "Why Is There Comorbidity between Substance Use Disorders and Mental Illnesses?" National Institute on Drug Abuse, https://www.drugabuse.gov/publications/research-reports/common-comorbidities-substance-use-disorders/why-there-comorbidity-between-substance-use-disorders-mental-illnesses.

10. Jeffrey Scherrer et al., "Prescription Opioid Duration, Dose, and Increased Risk of Depression in 3 Large Patient Populations," *Annals of Family Medicine*, 1, accessed January 2016, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4709156/.

11. Timothy Johnson, "Sources of Error in Substance Use Prevalence Surveys," US National Library of Medicine, last modified November 5, 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4897110/.

and opioid use, showing a significant overlap between America's mental health and opioid crises.

References

Baumgartner, Jesse C., and David Radley. "The Drug Overdose Toll in 2020 and Near-Term Actions for Addressing It." Commonwealth Fund. Last modified August 16, 2021. https://www.commonwealthfund.org/blog/2021/drug-overdose-toll-2020-and-near-term-actions-addressing-it.

Centers for Disease Control and Prevention. "About the National Health Interview Survey." National Center for Health Statistics. https://www.cdc.gov/nchs/nhis/about_nhis.htm.

Davis, Matthew, Lewei Lin, Haiyin Lu, and Brain Sites. "Prescription Opioid Use among Adults with Mental Health Disorders in the United States." *JABFM*. https://www.jabfm.org/content/30/4/407.

Feingold, Daniel, Silviu Brill, and Itay Goor-Aryeh. "The Association Between Severity of Depression and Prescription Opioid Misuse among Chronic Pain Patients with and without Anxiety: A cross-sectional study" [N]. *National Library of Medicine*. https://pubmed.ncbi.nlm.nih.gov/29660645/.

Johnson, Timothy. "Sources of Error in Substance Use Prevalence Surveys." US National Library of Medicine. Last modified November 5, 2014. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4897110/.

Kaiser Family Foundation. Last modified February 10, 2021. https://www.kff.org/coronavirus-covid-19/issue-brief/the-implications-of-covid-19-for-mental-health-and-substance-use/.

Mohamed, Ikram, Hossam Ahmad, Shehab Hassan, and Shymaa Hassan. "Assessment of Anxiety and Depression among Substance Use Disorder Patients: A Case-control Study." *Middle East Current Psychiatry*, 2020. Accessed June 3, 2020. https://mecp.springeropen.com/articles/10.1186/s43045-020-00029-w.

National Institutes of Health. "Opioid Overdose Crisis." National Institute on Drug Abuse. https://www.drugabuse.gov/drug-topics/opioids/opioid-overdose-crisis.

"Why Is There Comorbidity between Substance Use Disorders and Mental Illnesses?" National Institute on Drug Abuse. https://www.drugabuse.gov/publications/research-reports/common-comorbidities-substance-use-disorders/why-there-comorbidity-between-substance-use-disorders-mental-illnesses.

Scherrer, Jeffrey, Joanne Salas, Laurel Copeland, Eileen Stock, Brian Ahmedani, Mark Sullivan, and Thomas Burroughs. "Prescription Opioid Duration, Dose, and Increased Risk of Depression in 3 Large Patient Populations." *Annals of Family Medicine*. Accessed January 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4709156/.