Literature Review: Substance Use and Mental Health Among Young Adults and Ethnic Groups

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Introduction

Substance use and mental health are topics increasingly problematic across various populations. For college students, substance use, including use of alcohol and illicit drugs, is often linked to peer bonding and social connection. Moreover, due to stress and challenges that arise from academic life, college students frequently experience mental health issues. Mental health, encompassing emotional, psychological, and social well-being, influences how one thinks, feels, and acts, shaping stress management, relationships, and decision making. In general, young adults, including college students, also tend to experience more substance use and mental health issues compared to other subgroups.

Notably, 24.9% of Americans aged 12 or older use illicit drugs in the United States, and the percentage that reports using illicit drugs increased between 2021 and 2023 (Substance Abuse and Mental Health Services Administration, 2024). This percentage is highest among young adults aged 18-25 (39%) and Multiracial individuals (36.2%). Given these trends, to understand the impact of mental health and substance use challenges, it's important to examine mental health and substance use together, revealing how they are interconnected. This literature review, examining substance use and mental health across diverse groups, both unidirectionally and bidirectionally, shows that the relationship tends to be bidirectional: mental disorders can lead to substance use disorders, while substance use disorders can worsen mental health through changes in brain structure as well as function (Filbey *et al.*, 2014). Findings from this literature review inform targeted interventions towards those who experience substance use and mental health issues.

Domain Review

To understand the impact that substance use has on mental health, and vice versa, it is crucial to understand how substance use and mental health influence each other on a physiological level (brain function). By gaining an understanding on how substance use influences brain function on a physiological level, one can infer the influence that substance use has on mental health. Filbey *et al.* (2014), utilizing cross-sectional data (n=110) on marijuana use and brain MRI data, finds with parametric regression models that chronic marijuana users have lower OFC (orbitofrontal cortex) gray matter volume than non-using controls. The OFC gray matter volume plays an important role in emotional regulation, decision-making, reward processing, and behavioral control. So, when the brain has less OFC gray matter, emotional regulation, decision-making, reward processing, and behavioral control are all impaired. All of those functions of the OFC are integral components of mental health. Thus, this study reveals, on a physiological level, how marijuana use is associated with more mental health challenges. This study, similar to my research, uses cross sectional data to examine the association illicit substance use (marijuana) has with brain function. However, it leaves open questions about the **direct** influence illicit substance use has on mental health measures such as depression and suicidal thoughts, which my research addresses.

Inversely, Cheetham *et al.* (2012) examines the influence that brain structure during adolescence has on later cannabis use by age 16. Unlike Filbey *et al.* (2014), given longitudinal data (n=121), they use logistic regression to establish a predictive association between brain structure and later cannabis use. The study found that smaller OFC volumes at age 12 years predicted initiation of cannabis use by age 16 years. So, a theme is revealed across these two studies: a bidirectional association between cannabis use and brain OFC volume. Cannabis use

can lower brain OFC volume, while lower brain OFC volume can predict later Cannabis use. Overall, this work is relevant because it provides a unique, anatomical perspective on how substance use influences mental health, and supports the effect that early intervention can have on substance use and mental health outcomes.

Given the tendency of young adults to experience more substance use and mental health issues, research has been done on the relationship between substance use and mental health among young adults. Han *et al.* (2022), with multivariate logistic regression and poisson regression, examines mental health among 69,916 young adults (ages 18-25) that reported using illicit lysergic acid diethylamide (LSD) in the past year. Utilizing data from 2015-19 in the National Surveys on Drug and Health (NSDUH), they show that young adults with past-year illicit LSD use had a greater risk of suicidal ideation and any/serious mental illness compared to non-users. While this study supports that young adults who use illicit drugs are more likely to experience mental health issues than non-users, what this study doesn't do is look at illicit substance use specifically among multiracial young adults, which my research addresses. Yet, similar to this study, my research will use the 2023 NSDUH data and logistic regression to capture correlation between substance use and mental health, and vice versa.

Inversely, another study that used multivariate regression analyses (with mental health as the independent variable) found that young adults (ages 18-35) enrolled in integrated care in community mental health settings that used alcohol, illicit drugs, or cannabis with tobacco had higher mental health symptoms (e.g. more PTSD/anxiety disorder), but there was no correlation with emergency room or hospital use (Ferron *et al.*, 2024). This study shows that early intervention is helpful for successful treatment among young adults that experience mental health issues from drug use. In addition, this finding once again supports that mental illness correlates

with more substance use among young adults. Another goal of my research will be to build on this study, examining how illicit drug use relates to emergency room or hospital use specifically among multiracial young adults. This study also found that people who smoked were more likely to report using illicit drugs, so smoking will be a confounder I will account for in my research.

How substance use is associated with mental illness has also been researched in another key population: college students. Grant *et al.* (2019) reveals with chi-squared tests and ANOVA on 10,000 university students that a significant amount of university students in the United States that used e-cigarettes (a substance with nicotine more often used by college students) had significantly higher rates of ADHD, anxiety, and poorer self-esteem. Furthermore, university students that used e-cigarettes had higher rates of several types of substance use and higher impulsiveness. The researchers measured impulsiveness by using scales that took into account attentional impulsiveness, non-planning impulsiveness, and motor impulsiveness. This research captures that impulsivity is a potential confounder that influences both substance use and mental health. Moreover, McHugh *et al.* (2025), with logistic regression and mediation analysis on 1,829 first-year undergraduate students, found that higher levels of depression and substance use were related to higher impulsivity, indeed suggesting the mediating role that impulsivity has on the relationship between substance use and mental health. Consequently, in my research, I will aim to account for confounders in my analysis: e-cigarette use and impulsivity (if possible). In addition, to build on this research, I will use ANOVA and chi-squared tests (when necessary) to capture initial relationships between substance use and mental health.

Especially with multiracial young adults, discrimination is another key factor to consider when examining the relationship between substance use and mental health. Jones *et al.* (2017), with regression and mediation analyses, looks at substance use, discrimination, psychological

distress, and positive well-being among black and white US adults aged 18-28. They found that discrimination (higher among black adults) is directly associated with psychological distress and higher illicit substance use. This finding ties back into why I hypothesize the positive bidirectional relationship between illicit substance use and mental health issues in my research: significant discrimination among multiracial individuals. In addition, those who experience discrimination are more likely to use substances to cope with discrimination-related stress. Overall, this study is relevant because it provides a novel assessment of the discrimination-mental health-substance use relationship among young adults. However, while I won't be able to account for discrimination in my research, this research doesn't look at substance use and mental health relationship among multiracial youth specifically, making my research a novel contribution.

So far, this literature review has captured that substance use (e.g. cannabis, alcohol, tobacco) is associated with worse mental health in young adults, which include anxiety disorders and mental illness. Inversely, higher mental illness (e.g. PTSD/anxiety disorders) is associated with more substance use, including alcohol and illicit drugs. In addition, it's been revealed that e-cigarette use (will account for in my research), discrimination, and impulsivity are mediators of the relationship between substance use and mental health among young adults. However, this literature review has not examined research that utilizes **advanced** correlative techniques on the relationship between substance use and mental health.

The relationship between substance use and mental health, and vice versa is not always linear, so advanced correlative techniques account for that. Qi *et al.* (2024), with a combination of logistic regression, RCS (restricted cubic splines), and threshold analysis, looks at the association between drinking frequency and depression among 17,466 individuals aged 18 and

above. With RCS modeling the non-linear association between alcohol frequency and depression (PHQ-9), they find that there is an “M-Shaped” relationship between alcohol drinking frequency (categorical variable converted to a continuous variable) and depression. In addition, with threshold analysis, they describe the RCS visualization, showing that it has “inflection points”, or turning points, at 80 and 150. Specifically, when the drinking frequency ranged from 0 to 80, each additional drink increased the PHQ-9 score by 0.04. However, when the drinking frequency ranged from 80 to 150, each additional drink decreased the PHQ-9 score by 0.07. This work is relevant both because it’s cross-sectional like my research, and it highlights the methods that I will potentially utilize in the main analysis of my research: logistic regression, RCS, and threshold analysis.

If I can’t do logistic regression, RCS, and threshold analysis in my research, what other advanced correlative techniques are available? Another option is to create predictive models with machine learning that predict depression and suicide risk outcomes based on cannabis use. Choi *et al.* (2021), using individuals aged 20 to 49 from the 2019 NSDUH, built multiple depression and suicide risk prediction models with RF (random forest) and KNN (k-nearest neighbors), finding that the models had 74% to 99.8% accuracy. Overall, the RF (random forest) models, which are more advanced machine learning techniques, showed the highest performance. If I decide to do predictions instead of looking at associations in my research, this research is highly relevant in showing how I can implement advanced machine learning techniques to predict substance use as well as mental health outcomes. However, once again, what this research doesn’t do is look at the bidirectional association between illicit substance use and mental health specifically among multiracial young adults, which my research will most likely address.

Conclusion

Substance use and mental health exhibit a well-established bidirectional relationship. Substance use (e.g. cannabis, alcohol, tobacco) is correlated with worse mental health in young adults, which include anxiety disorders and mental illness. Inversely, higher mental illness (e.g. PTSD/anxiety disorders) is correlated with more substance use, including alcohol and illicit drugs. But, when it comes to emergency department visits, mental health is not associated with substance use, revealing to public health officials the crucial role that early intervention plays in preventing mental health as well as substance use from getting worse. In addition, e-cigarette use (which I will account for in my research), discrimination (specific to racial minorities), and impulsivity are mediators of the relationship between substance use and mental health among young adults. Finally, potential non-linear associations exist between substance use and mental health, as evidenced by research showing an "M-Shaped" relationship between alcohol frequency and depression. This research uses varying combinations of chi-squared tests, logistic regression, machine learning, RCS, and threshold analysis to generate these insights. Given my desire to show the strength of the association between substance and mental health, my research, adjusting for confounders, will most likely implement a combination of chi-squared tests, logistic regression, RCS, and threshold analysis. Following this literature review the question remains, which I will address in my research: what does the bidirectional association between substance use and mental health look like among multiracial young adults aged 18-25?

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