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Substance Use Among Trajectories Among College Graduates:
Associations with Employment Status, Living Conditions, and Negative Mood States

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Trinity College

Fall 2020 – Spring 2021

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Table of Contents

Introduction	5
Background.....	8
Theory of Maturing out.....	8
Alcohol Use.....	9
Other Substance Use.....	13
Transitioning Developmental Roles.....	14
Mental Illness and Substance Use.....	16
Impact of COVID-19.....	18
The Current Study.....	19
Method.....	20
Participants.....	21
Measures.....	21
Substance Use.....	21
Negative Affect.....	22
Employment Status.....	23
Living Situation.....	24
Design and Procedure.....	24
Data Analysis Plan.....	25
Results.....	26
Frequency of Substance Use.....	26
Gender Differences.....	27
Depression, Anxiety, and Stress and Changes in Substance Use.....	28

Living Situation and Substance Use.....	28
Employment Status and Substance Use.....	29
Exploratory Questions.....	29
Changes in Substance Use Frequencies Within the Last 30 Days.....	30
Substance Use Changes in Relation to Disruptions in Employment.....	31
Discussion.....	32
Key Findings on Substance Use.....	32
Depression, Anxiety, and Stress.....	34
Living Situation.....	35
Employment Status.....	36
Emerging Adults' Functioning During COVID-19.....	37
Changes in Depression, Anxiety, and Stress.....	37
Substance Use Frequencies.....	38
Substance Use Changes in Relation to Disruptions in Employment.....	39
Limitations and Future Directions.....	39
Implications.....	41
References.....	44
Table.....	50
Figures.....	51

Substance Use Trajectories Among College Graduates: Associations with Living Conditions, Employment Status, and Negative Mood States

The period of one's life referred to as "young adulthood" (between ages 18 to 25) is a major transitional time. This time frame, also referred to as "emerging adulthood", is "characterized by a variety of developmental tasks...that must be confronted and mastered in order to make a successful transition to adulthood" (White et al., 2005, p. XX). Failure to complete such developmental tasks during these turbulent times can result in stress, which may lead to unhealthy actions (White et al., 2005). During young adulthood, many leave their childhood behind by becoming more independent, moving out of their family's homes and beginning their own life paths. College students in the United States, typically 18 to 22 years of age, are in the first phase of emerging adulthood. College graduates, on the other hand, tend to be in the second half of emerging adulthood (ages 21 to 25), which is typically a time for transition from college to non-college life and the workforce. These times can be filled with uncertainty, anxiety, and misdirection, and can leave college graduates even more vulnerable to harmful life choices, such as substance misuse. However, it is reasonable to assume that some emerging adults will navigate this transitional time more smoothly than others. Accordingly, it is important to examine psychological and demographic factors that might help to distinguish emerging adults who ultimately adopt healthier substance use behaviors. Moreover, since most of the research on substance misuse is focused on individuals in the first part of emerging adulthood, more research is needed on substance use behaviors following college.

Substance use is very prevalent among emerging adults. National data from 2018 revealed that 1 in 10 young American adults has an alcohol use disorder, 1 in 17 young adults has a marijuana use disorder, and 1 in 18 young adults has misused opioids (NSDUH, 2019).

Additionally, data collected by Substance Abuse and Mental Health Services Administration, or SAMHSA, showed that young adults had the highest marijuana, cigarette, alcohol, and prescription drug usage rates compared to any other age range (NSDUH, 2019). In 2018, 10.1% of young adults had an alcohol use disorder, compared to 5.1% of adults 26 years of age and older (NSDUH, 2019). Additionally, 6.5% of young adults had misused prescription stimulants in the past year, compared to 1.5% of adolescents (12-17 years old) and 1.2% of adults (aged 26 and older) (NSDUH, 2019). Furthermore, 19.1% of young adults reported current cigarette use in 2018, in comparison to 2.7% of adolescents and 18.5% of adults aged 26 or older (Lipari, 2018). Moreover, the rates of substance use in comparison to prior years have greatly increased. According to a 2019 SAMHSA report, the percentage of people 18-25 who were using marijuana increased from 22.1% in 2018, to 23% in 2019 (Lipari, 2018). Additionally, cocaine and LSD use among young adults has increased since 2018 (Lipari, 2018). Given the elevated prevalence of substance misuse among emerging adult populations and apparent increases over time, it is important to examine what makes people in this developmental period more vulnerable to substance use and misuse.

In addition to being vulnerable to substance misuse, young adults also are prone to psychological disorders. Indeed, a large body of literature has shown that more than any other age group, young adults are the most frequently diagnosed with psychological disorders. As reported by SAMHSA in 2019, approximately 7.7% of young adults (aged 18-25) had a serious mental illness within the past year, in comparison to 5.9% of adults (aged 26 to 49), and 2.5% of people aged 50+ (Lipari, 2018). Moreover, the COVID-19 pandemic has negatively impacted people of all ages on a global level and has had a negative effect on people's mental health. Specifically, regarding young adults (18-24), the CDC reported that they are experiencing the

most psychological difficulties in comparison to other age groups: 49.1% of young adults experienced an anxiety disorder during the COVID-19 pandemic, 52.3% reported a depressive disorder, and 25.5% of young adults had suicidal ideations (CDC, 2020).

Psychological disorders not only have a detrimental impact on one's mental health, but they also can be a risk factor for substance use (Swendsen et al., 2010). In 2018, data collected through a national survey showed that 7.2% of young adults were diagnosed with both a substance use disorder and a psychological disorder (Lipari, 2018). In regard to pandemic data reported by the CDC, 24.7% of young adults reported starting or increasing substance use to cope with pandemic-related stress, compared to 19.5% of 25–44-year-olds and 7.7% of 45–64-year-olds (CDC, 2020). These statistics are generally concerning and suggest that people aged 18 to 26 are at a higher risk of not only developing a mental illness, but also a substance use problem. As aforementioned, the transition from college to non-college life can be particularly turbulent due to many life changes occurring in a short amount of time. Layering a pandemic onto an already vulnerable time may set the stage for even more substance and psychological problems.

While many studies have been conducted on substance use and mental illness amongst both college-aged students and young adults, fewer studies have focused on the period of time immediately following college. Although it is of importance to examine trends of substance use and abuse in the overall young adult population, it is also crucial to focus on the later end of young adulthood, when transitions are occurring more frequently, and many adopt developmental roles (e.g., entering the workforce, living independently) that come with emerging adulthood. By examining the trends of substance misuse, mental illnesses, and other impactful factors (such as employment status or living circumstances) occurring toward the latter

end of young adulthood, the transition from young adulthood to adulthood would be better understood and potential protective factors could be identified. Accordingly, in the current study, I examined relations among substance use, negative mood states (e.g., depression, stress, and anxiety), and the aforementioned sociodemographic factors (e.g., employment status), following college graduation and in the midst of the COVID-19 pandemic.

Background

Theory of Maturing Out

Substance use is often found to be age-related, in that the prevalence of substance use is often found to decline with age. “Maturing out” or “aging out” are terms often used to describe the sharp decline of substance use in relation to age. The theory of maturing out is a widely studied concept amongst psychologists examining substance use, and while the theory is generally robust across substance use, different maturing out patterns are apparent in differing subpopulations and substances. More specifically, trajectories of substance use and misuse have been shown to vary a considerable amount between different demographic groups (e.g., gender, race, socioeconomic status, family history) and substances (e.g., alcohol use trajectories are different than marijuana use trajectories). Additionally, in some cases, maturing out has been vaguely defined due to varying results and a lack of research on common trends and impactful factors (Verges et al., 2013).

Trajectories of maturing out have been shown to differ by substance. For example, alcohol use is thought to yield different maturing out trajectories compared to drug use. That is, people with drug use disorders appear to recover earlier in the lifespan in comparison to those with alcohol use disorders (Verges et al., 2013). Although maturing out is normative, there are also large amounts of variability found within individuals’ courses of substance use that are not

in line with the normative trends (Miller et al., 2013). This variability makes it more difficult to provide a blanket definition and prediction of maturing out trajectories for all substances and substance use problems.

Alcohol Use

The majority of people who use alcohol tend to follow normative trends of maturing out, showing a general downward trajectory with increased age, likely due to the adoption of transitional roles during young adulthood and adulthood (Lee & Sher, 2018). However, while many non-problem drinkers show evidence of decreased alcohol use, they don't necessarily stop drinking altogether, or show drastic declines in alcohol use. The factors responsible for continued alcohol use (rather than complete cessation of alcohol use) are largely unknown, but a literature review by Matthew Lee and Kenneth Sher (2018) noted several potential factors. Lee and Sher (2018) found that many people tend to mature out of substance use after young adulthood and into adulthood, but a sizeable percentage continue to drink at high levels or even evidence an increase in problem drinking behaviors. Furthermore, the authors noted that maturing out of alcohol use and problem drinking is not confined solely to young adulthood, but the process tends to begin in young adulthood and continue on for the duration of one's life (Lee & Sher, 2018). Additionally, the greatest alcohol use increases have been found to occur during the transition from adolescence to young adulthood (Windle, 2020a). This is likely due to the normative presence and consumption of alcohol during many social situations and in many social environments that are encountered during this period of life (e.g., parties, bars, social celebrations) coinciding with a lack of parental supervision, particularly for students who move away from home to attend college.

Social role transitions frequently have been identified as factors that can impact the process of maturing out of alcohol use. Employment status in particular was found to have a large impact on aging out of substance use post-college graduation; that is, young adults working more hours were found to be at a higher risk of continuing substance use than those working part-time or unemployed (Cadigan et al., 2019). In contrast, other studies have found full-time employment to have an opposite effect on substance use trajectories. For instance, a study done by Verges et al. (2013) found full-time employment was a preventative factor for increasing substance use, but also that change in employment status (such as losing a job or getting a new job) was associated with persistence of substance use. Additionally, marriage and parenting during young adulthood can have a positive impact on maturing out and declines in problem drinking (Lee & Sher, 2018).

In line with aforementioned research, experiencing changes in one's relationship status (e.g., breaking up with a partner, establishing a new relationship) was associated with higher rates of alcohol use in comparison to those in stable romantic relationships (Cadigan et al., 2019). Cadigan et al. also examined the impact of living situations and found that people living with their families were less likely to engage in alcohol use than those living without parents. Interesting, Lee and Sher (2018) noted that role transitions may affect alcohol consumption via both socialization and selection. Regarding socialization, certain responsibilities (e.g., parenting) may leave less time for socializing with friends who drink. With respect to selection, people who use alcohol often and in large amount may be less inclined to adopt roles (e.g., spouse, parent) that carry more responsibility. Overall, although social role transitions can lead people to drink less, there is still significant variation in the timing of when these reductions happen (Windle, 2020a).

Age-related changes in personality also have been shown to underlie reductions in alcohol use (Lee & Sher, 2018). Such changes in personality are likely related to the adoption of new developmental and social roles that come with age, causing an increase in maturity and a decrease in impulsivity (Littlefield et al., 2010). Reductions of alcohol use, impulsivity, and neuroticism have been shown in people ages 18 to 35, in addition to corresponding increases in conscientiousness (Lee & Sher, 2018; Littlefield et al., 2010). Despite the early to mid 20's as being the peak for alcohol use and binge drinking, other studies have also found age-related changes in personality traits during this time to be important mechanisms of the maturing out process (Windle, 2020a). The ways in which these personality changes operate to ultimately reduce drinking, however, have not yet been identified (Lee & Sher, 2018).

Furthermore, racial, ethnic, and cultural roles were found to impact the trajectories of substance use from adolescence to late adulthood (Chen & Jacobson, 2012). Hispanic individuals were found to have the highest levels of substance use during early adulthood compared to other ethnicities, and Caucasians showed the greatest increases of substance use during the transition from adolescence to young adulthood (Chen & Jacobsen, 2012). Additionally, substance use within African American populations was found to be lowest during adolescence and highest in the years following emerging adulthood (Chen & Jacobsen, 2012). Gender was also reported as a factor impacting alcohol use and maturing out trajectories. Chen and Jacobsen (2012) found males reported higher rates of substance use during young adulthood compared to females. Additionally, males have shown greater increases in alcohol problems during adolescence and into emerging adulthood than females (Windle, 2020b). Furthermore, females were found to mature out of heavy drinking episodes earlier in life than males (Windle, 2020b).

Several studies have identified notable factors that can affect the timing and likelihood of maturing out of alcohol use. A study using latent transition analysis found four underlying drinking statuses in the sample from their longitudinal study. The sample consisted of 844 high-risk participants (51% children of alcoholics, 53% male, 71% non-Hispanic Caucasian, 27% Hispanic) that were followed through the beginning of emerging adulthood (ages 17 to 22), the remainder of emerging adulthood (23 to 28), and later adulthood (29 to 40). The four drinking statuses included: (1) abstainers, (2) low-risk drinkers (i.e., “drank less than weekly and were at low risk for bingeing and AUD symptomatology”); (3) moderate-risk drinkers (i.e., “binged less than weekly and were at moderate risk for AUD symptomatology”); and (4) high-risk drinkers (i.e., “binged at least weekly and were at high risk for bingeing and AUD symptomatology”) (Lee et al., 2013). A noticeable pattern emerged within these drinking statuses; specifically, Lee et al. (2013) found maturing out to be more common among people with initially high-risk drinking behavior, rather than people with moderate to lower risk drinking behaviors. The authors noted that 47.4% of the high-risk drinkers migrated to a lower risk group by the end of the study, in comparison to only 17.4% of moderate-risk drinkers and 6% of low-risk drinkers who showed change over the 20-year period (Lee et al., 2013). Additionally, high-risk drinkers were most likely to mature out of heavier drinking patterns between the early (ages 17-22) and later stages (23-28) of emerging adulthood, and rather than completely abstaining from alcohol, they went from being high-risk to moderate-risk drinkers (Lee et al., 2013).

Consistent with the aforementioned findings, maturing out of alcohol use most frequently occurs within the subset of individuals that have preexisting moderate to high levels of alcohol use (Windle, 2020a). Additionally, these individuals appeared to reduce, rather than completely mature out of high-risk drinking behavior and becoming abstinent or low-risk drinkers (Lee et

al., 2013). The largest declines within high-risk drinkers occurred between adolescence and young adulthood, whereas the transition from young adulthood to adulthood yielded more stability in persistence of alcohol use. Furthermore, the individuals in the moderate to high use groups evidenced poorer health, occupational, and social outcomes in comparison to the normative use group. These findings show the importance of better understanding substance use trajectories, as they are not useful for just understanding substance use patterns, but also for understanding or predicting individuals' levels of overall functioning. Additionally, Lee & Sher (2018) found that the risk of becoming a problem-drinker tends to decline with age, and that maturing out of a preexisting drinking problem most often occurs during young adulthood. Given that the period right after the college years appears to be an important inflection point for people whose drinking is riskier, more in-depth research focused on this developmental touchpoint is needed to clarify the specific influences that might be motivating these declines, especially among heavier users.

Other Substance Use

Trends of drug use and drug use disorders commonly show a steep decline in prevalence with increasing age (Verges et al., 2013). This declining trajectory is thought to occur due to the onset of fewer drug use disorders rather than lower frequency of use. These findings are somewhat consistent with the findings for alcohol use trajectories, as persistence of drug use tends to remain stable throughout adulthood, while vulnerability or risk of onset of a drug use disorder decreases with age. Furthermore, longitudinal studies have shown stable rates of persistence with age among drug users, indicating that declining drug use rates are not due to decline of persistence but rather a decline in prevalence (Verges et al., 2013). Furthermore, several studies have noted a significant increase in substance use towards the beginning of young

adulthood (early 20s), and a significant decline of substance use towards the end of young adulthood and into adulthood (late 20s and early 30s) (Windle, 2020a). More specifically, cigarette and marijuana use typically show steeper increases during adolescence and into young adulthood, and an overall decline following young adulthood (Windle, 2020a).

Further, the rate at which males and females mature out of substance use and misuse has been found to vary by substance and by sex (Lipari, 2018; Windle, 2020b). Maturing out of cigarette and marijuana use in particular have both been shown to be affected by differences in sex (SAMSHA, 2014; Windle, 2020b). For example, females tend to mature out of cigarette and marijuana use earlier in life than males (Windle, 2020b). Additionally, while females have been found to have higher initial substance use levels than males (Chen & Jacobson, 2012), males exhibited higher levels of substance use during adolescence and into adulthood, in addition to slower rates of maturing out than females (Windle, 2020b).

Race and ethnicity also have been examined in relation to maturing out of substance use and misuse. A study comparing African American, Asians, Caucasian, and Hispanic populations and their substance use trajectories found Caucasians to report the highest rates of cigarette smoking during adolescence and young adulthood, but African Americans as having the highest rates of smoking after the age of 30 (Chen & Jacobson, 2012). Additionally, African Americans reported the highest levels of marijuana use towards the later end of young adulthood (Chen & Jacobson, 2012).

Transitioning Developmental Roles

Similar to alcohol use and maturing out findings, many studies have shown that transitional, or developmental roles have an impact on substance use behaviors in both young adults and adults (Verges et al., 2013). Gaining employment is a developmental milestone that

many people achieve early in young adulthood; consequently, failure to enter the workforce following college can be quite discouraging. The ability to successfully join the workforce and maintain a stable job is frequently found to be a factor involved in maturing out of drug use during young adulthood, whereas unemployment is often found to be associated with higher rates of drug use (Verges et al., 2013). Furthermore, instability in employment status (such as losing or gaining a job) has been found to be associated with persisting substance use (Verges et al., 2013). While unstable employment status can potentially delay maturing out, it was found to be less impactful than other developmental roles such as marriage and parenthood (Cadigan et al., 2019; Verges et al., 2013).

Interestingly, first-time marriage or parenthood has been found to have a strong impact on maturing out of marijuana and cocaine use (Kandel & Raveis, 1989). However, fluctuations or instability in relationship, marriage, or parenthood statuses during young adulthood and adulthood have been found to increase risk of onset of a drug use disorder (Overbeek et al., 2003). Moreover, the effect that employment status, marriage, and parenthood on maturing out of drug use was found to be more impactful for females than males (Verges et al., 2013). Some researchers suggested that the assumptions women have about the aforementioned roles could dissuade them from substance use or misuse when taking on transitional roles (Kerr-Correa et al., 2007; Lee et al., 2018). In addition, females that use substances reported experiencing higher levels of bias than male substance users, making it less stigmatized for males to continue substance use despite the adoption of new developmental roles (Kerr-Correa et al., 2007).

In addition to developmental role transitions, young adulthood also is filled with social transitions. Entering the workforce or becoming a parent causes a shift in relationships and the formation of new friendships. Young adults have been found to adopt similar beliefs about

substance use as their peers, so new relationships being formed at work, through marriage, or during parenthood can have an impact on one's substance use behaviors (Labouvie, 1996). The adoption of transitional roles amongst new peers causes an overall decline in perceived illicit drug and cigarette use among young adults, forming a normative trend of illicit drug and cigarette cessation (Labouvie, 1996). Moreover, those using drugs in a social context are more likely to mature out of drug use than those using drugs in attempt to cope or self-medicate (Kandel et al., 1989). For example, the declining perceived acceptance of cocaine use amongst peers during young adulthood was associated with the cessation of cocaine and other illicit drug use (Kandel et al., 1989). Overall, the extent at which one matures out of substance use appears to be impacted by or related to one's responsibilities, relationships, personality traits, employment status, living status, gender, and race.

Mental Illness and Substance Use

As aforementioned, substance use and psychological disorders are very prevalent among young adults, as they are more susceptible to stressors and risk behavior due to the developmental transitions occurring this period of life. Approximately 2.6% of young adults reported having a serious mental illness and concurring substance use disorder within the past year, further exhibiting the vulnerability of young adulthood and the strong associations between mental and substance disorders (NSDUH, 2019). Furthermore, substantial literature has shown the comorbidity of mental illnesses and substance use, and these comorbidities only increase the persistence and severity of both mental disorders and substance abuse (Lai et al., 2015; Swendsen et al., 2010). While the associations between the two have been widely confirmed, the causal effects that mental disorders and substance use have on each other continue to be debated.

Literature examining the order of onset of mental disorders and substance use can be used

to better understand the causality between the two. Several studies have found substance use behavior to occur prior to development of certain mental disorders, insinuating substance use can cause or predict onset of mental illness (Breslau et al., 2004). In contrast, many longitudinal studies have found the prevalence of certain mental disorders to predict later onset of substance use and abuse (Swendsen et al., 2010). Swendsen et al. further confirmed mental disorders as being risk factors for substance use later in life, as they more frequently precede the onset of substance use and are correlated with heightened chances of substance use disorder development (Swendsen et al., 2010). Additionally, stronger associations were found between certain mental illnesses and drug use in women than in men, with greater comorbidity between women and mood, anxiety, substance use disorders (Conway et al., 2006).

There are many different kinds of psychological disorders, and certain types of disorders and symptoms are found to be associated with higher probabilities of substance use or misuse. Depression, a mood disorder more prevalent among the young adult population than any other age group, is often associated with substance use and misuse. Nearly 14% of young adults reported having at least one major depressive episode within the past year (NSDUH, 2019). Depressive symptoms have been found to be a risk factor for the initiation of alcohol use, and persistent depression has a strong association with the development of alcohol use disorders (Goldstein et al., 2015; McCarty et al., 2012). Additionally, the presence of depressive symptoms or disorders while using tobacco and cannabis were found to significantly increase one's risk of developing a cannabis use disorder (Lee et al., 2018). Moderate to heavy cannabis use was found to significantly increase one's risk of developing a depressive disorder (Lev-Ran et al., 2013). Major depression and other mood disorders have been found to have the strongest association with illicit drug use in comparison to other mental disorders, followed by anxiety disorders

(Conway et al., 2006; Lai et al., 2015).

Anxiety disorders also are significantly associated with substance use. More specifically, anxiety disorders such as panic disorder and social phobia have been significantly associated with the onset of nicotine dependence, alcohol abuse, and illicit drug abuse or dependence (Swendsen et al., 2010). Additionally, panic disorders (with or without agoraphobia) are more significantly associated with tranquilizers, sedatives, and opioids, than other anxiety or mood disorders (Conway et al., 2006). In contrast, generalized and other anxiety disorders were not associated with higher risk of illicit tranquilizer, opioid, and sedative drug use (Conway et al., 2006).

ADHD has also shown significant associations with substance use disorders, and it is a risk factor for the onset of young adult substance use and tobacco smoking in both males and females (Wilens et al., 2011). Prescription stimulants are often prescribed as a treatment for people with ADHD, yet people with more severe cases of ADHD are more likely to misuse their prescribed stimulants (Schepis et al., 2020). Self-medication has been alluded to as a potential causal mechanism of mental disorders and substance use comorbidity (Swendsen et al., 2010), as adolescents who have undergone trauma are more likely to self-medicate through substance use, along with people perceiving high levels of immediate stress (Berenz et al., 2019; Schepis et al., 2020). Moreover, research has found that people with mood disorders are more likely to self-medicate than people with anxiety disorders (Conway et al., 2006).

Impact of COVID-19

SARS-CoV-2, frequently referred to as the coronavirus or COVID-19, has had a substantially negative effect on mental health. As a result of the pandemic, elevated rates of stress, anxiety, and depression symptoms have been reported on a global scale (Czeisler et al.,

2020). Consequently, as mental illnesses are associated with drug and alcohol use, rates of substance use persistence and onset also have increased (Czeisler et al., 2020). As noted previously, rates of mental illnesses and symptoms continue to be higher among young adults than other age groups, with 49.1% of 18- to 24-year-olds reporting symptoms of an anxiety disorder, and 52.3% reporting symptoms of a depressive disorder (Czeisler et al., 2020). Additionally, 24.7% of young adults reported starting or increasing substance use as a form of self-medication in order to cope with pandemic-related emotions.

These statistics are particularly concerning, as the later end of young adulthood marks the adoption of transitional roles that aid in maturing out of substance use and tend to have positive impact on mental health. However, many young adults have not been able to take on these developmental roles due to the pandemic. Millions of people across the country have become unemployed as a result COVID-19, making it more difficult for young adults to get a job and enter the workforce (Jemberie et al., 2020). Independence is lacking, as many young adults are moving back home with their families due to the pandemic's negative impact on the economy. New relationships are much more difficult to establish during the pandemic, and existing ones are harder to maintain. The developmental roles that come with young adulthood (that are thought to be detrimental to successfully transition into adulthood) are being stunted (White et al., 2005). It is also frequently noted that failure to complete such developmental tasks during young adulthood may result in stress and unhealthy behavior (White et al., 2005). Therefore, it is likely that the stunted transition due to the pandemic may lead to increased psychological distress and substance use and misuse among young adults.

The Current Study

Using data from a one-year longitudinal survey that assessed recent college graduates' substance use, mental health, and sociodemographic characteristics, the current study aimed to describe changes in young adults' substance use in the year following college graduation. In addition, the current study aimed to identify specific psychological (depression, anxiety, stress) and demographic (gender, race, employment status, living situation) factors associated with reductions in, and persistence in substance use post-graduation. Based on previous literature, I have several hypotheses and research questions. While the pandemic makes it difficult to determine whether changes in substance use will increase or decrease in this young adult population due to unprecedented factors affecting the transitional roles that come during this developmental time, I hypothesized:

1. Rates of all substance use (i.e., alcohol, nicotine, marijuana, cocaine, and prescription drug misuse) will decline.
2. Participants who report an increase in depression, anxiety, and stress over the one-year period also will report an increase in substance use.
3. Individuals who are unemployed and/or who live outside of their family's home will report higher rates of substance use than those with some type of employment or those who live with family.

I explored several research questions as well. First, I examined whether there were gender or racial/ethnic differences in substance use change over the one-year period. Given the stressors posed by the pandemic, I also examined how depression, anxiety, and stress changed over one year and past month changes in substance use at the one-year time point, which was one of the first months of the pandemic.

Method

Participants

A total of 103 participants completed an online baseline survey; slightly more than half ($n = 55$) of the 103 participants were recent graduates of Bates College, and 48 were recent Trinity College graduates. Most of these participants (88%; $N = 91$) followed up by completing a second online survey that was distributed one-year later. Six participants from each institution did not respond to the one-year follow-up survey (see Figure 1 for participant flow). Participants who did not respond to the one-year follow-up survey did not differ from one-year respondents on any of the study variables except for age: nonrespondents were slightly older ($M = 22.83$, $SD = 1.90$) than respondents ($M = 22.85$, $SD = 1.43$) ($t = -2.16$, $df = 101$, $p = .03$). The average participant age at the time of baseline survey response was 21.96 ($SD = 1.51$) with 65% identifying as female, 33% identifying as male, 1% identifying as gender fluid or queer, and 1% as not identifying with any of the listed options. Most (83%) participants were Caucasian, 3% were African American/Black, 7% were Asian/Asian American/Pacific Islander, 5% were Latino, and 3% were other/multiracial (Table 1).

Measures

Substance Use

At baseline, participants were asked a series of questions to determine their recent substance use. Specifically, participants were asked to estimate the number of occasions (within the last year) they used the following: tobacco/nicotine, alcohol, marijuana, cocaine, hallucinogens (psilocybin, LSD, mescaline, etc.), prescription pain killers (used without a prescription or more than was prescribed), and prescription anti-anxiety medications (used without a prescription or more than was prescribed). Participants reported their answers using a 7-point scale, ranging from “never (1)” to “40 or more times (7)”.

During the one-year follow up survey, participants reported how many times they used tobacco/nicotine (including vaping), alcohol, marijuana, cocaine, hallucinogens (psilocybin, LSD, mescaline, etc.), prescription pain killers (used without a prescription or more than was prescribed), and prescription anti-anxiety medications (used without a prescription or more than was prescribed) within the last year and within the last 30 days. Participants were asked to respond with a 7-point Likert scale, which ranged from “never (1)” to “40 or more times (7)”. Furthermore, participants were asked to indicate the extent to which their substance use (tobacco/nicotine, alcohol, marijuana, cocaine, hallucinogens, prescription pain killers, prescription anti-anxiety medications) had changed, if at all, within the last 30 days. Participants responded using a three-point scale, ranging from “increased (1)”, “remained about the same (2)”, or “decreased (3)”.

Negative Affect

Participants were asked at baseline and at the one-year follow up to report on symptoms of depression, anxiety, and stress within the past week. The 21 items on the Depression, Anxiety, and Stress Scales (DASS-21; Lovibond & Lovibond, 1995) are divided into three subscales, each with 7 items addressing depression, anxiety, and stress. The response options for all of the questions were: did not apply at all (0), applied to me some of the time (1), applied to me about half of the time (2), applied to me a good part of the time (3), applied to me most of the time (4). Responses for each subscale were summed and multiplied by two to allow for comparability with the 42-item DASS.

Sample depressive symptoms included: I couldn't seem to experience any positive feeling at all; I found it difficult to work up the initiative to do things; I felt that I had nothing to look forward to; I felt downhearted and blue; I felt that life was meaningless; I was unable to

become enthusiastic about anything; I felt I wasn't worth much as a person. Reliabilities of this subscale at baseline ($\alpha = .92$) and one year ($\alpha = .93$) were excellent.

Questions comprising the anxiety subscale included: I was aware of dryness of my mouth; I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion); I experienced trembling (e.g., in the hands); I was worried about situations in which I might panic and make a fool of myself; I felt I was close to panic; I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat); I felt scared without any good reason. Reliabilities of this subscale at baseline ($\alpha = .86$) and one year ($\alpha = .74$) were good to acceptable.

Finally, questions on the stress subscale included: I found it hard to wind down; I tended to over-react to situations; I felt that I was using a lot of nervous energy; I found myself getting agitated; I found it difficult to relax; I was intolerant of anything that kept me from getting on with what I was doing; I felt that I was rather touchy. Reliability of this subscale at baseline and one year ($\alpha = .86$) was good.

Employment Status

At baseline, all participants responding to the survey were college seniors. Although some participants might have had a part-time job during their senior year, participants were not asked about their employment status due to being currently enrolled in college. However, participants were asked what their plans were for after graduation (even if tentative). During the one-year follow up survey, participants were asked to describe the industry in which they worked (if applicable) following graduation. They also reported their employment status 1 to 3 months prior to the beginning of the COVID-19 pandemic by responding with one or more of the following: employed full-time (40 hours/week or more), employed part-time (less than 40

hours/week), unemployed and currently looking for work, unemployed and not currently looking for work, graduate student, self-employed, unable to work. Participants were also asked to describe any changes in employment or graduate work due to COVID-19 (e.g., furloughed, laid off or fired, hired, still going into the office, working from home, etc.) through an open-response question. Participants' employment status following the onset of the COVID-19 pandemic can be seen in Figure 2.

Living Situation

At the one-year follow up, participants were asked to describe their current living circumstances with an open-response question. Their responses were prompted with the following questions: "Does your state/community/area have stay-at-home orders? Did you have to move residences on account of COVID-19? Are you now living with your family of origin? A significant other? With friends? Alone?" Participants responded by typing their answers in a text box. We coded each participant's response as either (1) living at home/with family of origin, or (2) living away from home/away from family of origin.

Design and Procedure

The current study was part of a larger, two-year longitudinal study examining predictors of prescription stimulant misuse (PSM) and other substance misuse following college graduation. Two-year follow-up data had not yet been collected, which is why this study focused on the one-year data. Students in their last semester of college were eligible to complete an online screening survey, which inquired about their demographic characteristics, history of substance use and misuse, self-efficacy to avoid prescription stimulant misuse, and intentions to misuse prescription stimulants. The "Transition Study" was advertised widely on both campuses;

specifically, the URL for the screening survey was publicized using flyers, business cards, announcements in classes, and word of mouth.

There were several ways students could screen into the current study. Students who reported PSM in college automatically screened in and were redirected to the consent form and baseline survey. Students also could screen in if they reported any illicit substance use in the past year and diminished self-efficacy to resist PSM or any intentions to misuse prescription stimulants. In order to participate in the study, students needed to provide consent by clicking “yes” in order to indicate that they were at least 18 years of age and to give consent. The purposes of the research, procedure, risks, confidentiality, compensation, voluntary participation, and questions/concerns about the research all were outlined in the consent prior to the baseline survey. At baseline, participants were compensated a \$10 gift card to an on-campus coffee shop, and at the one-year follow up, participants were compensated a \$25 gift card to Amazon. Participants from both campuses were sent a small college-themed gift approximately 6-8months after the baseline survey to encourage participation at the one-year follow-up. Participants also were contacted at several points in time to confirm their mailing and e-mail addresses.

Data Analysis Plan

In order to test my hypotheses, I used a variety of procedures and statistical tests in SPSS Version 26. Specifically, to test my first hypothesis that substance use would decline over the one-year period, I examined the data in two different ways: first, with a continuous version of the substance use measures and then with a categorical version. For the continuous version, we first summed participants’ responses to the frequency questions for each of the substances at each time point and then subtracted the baseline composite score from the one-year composite score for each of the seven substances to create an overall mean change in substance use score.

Second, based on these change scores, we classified participants into an “increase”, “stayed the same” or “decrease” group for each substance. Doing so allowed us to evaluate the frequencies of each behavior pattern *by substance*. To examine potential gender differences in mean substance use change, we first used an independent samples t-test. We also used crosstabs and Chi-square analyses to examine whether the percentage of males and females in the increase, stayed the same, or decrease categories were different from the expected values for each substance.

To test my second hypothesis, I ran correlations between overall substance use change scores and change scores for depression, anxiety, and stress. For my third hypothesis, namely that people living with their family of origin would be more likely to report a reduction in their substance use, I ran two analyses: First, I ran an independent samples t-test to see if there were differences in overall substance use change. Second, I ran crosstabs with Chi-square tests to see if people living with their family of origin (vs. those living independently) were more likely to report an increase in their use of one or more of the seven substances.

For my fourth hypothesis, I used a one-way analysis of variance (ANOVA) to determine if participants who were employed full-time (vs. part-time, students, unemployed) reported lower overall mean rates of substance use at one year.

Results

Frequency of Substance Use

I hypothesized that the frequency of all substance use (e.g., nicotine, alcohol, marijuana, cocaine) would show an overall decline over the one-year period. To test my first hypothesis, I examined the overall mean change in substance use from baseline to year one. This hypothesis was supported, in that overall mean score ($M = -1.6778$) was negative, indicating that when

increases and decreases for all substances were combined, there was a net decline. However, a frequency analysis examining the percentage of participants who (1) increased their substance use, (2) stayed the same, or (3) decreased, showed that the most frequent response for all substances was that participants' substance use remained the same. Specifically, 50% of participants reported no change in nicotine use; 69% of participants reported no change in alcohol use; 46% of participants reported no change in marijuana use; 58% of participants reported no change in cocaine use; 77% of participants reported no change in hallucinogen use; 92% of participants reported no change in opioid use; and 80% of participants reported no change in benzodiazepine use. Thus, although the composite quantitative substance use variable showed a slight decline, no change was the most common response, as opposed to reporting a decrease in substance use. Figures 3 and 4 show the percentage of participants reporting an increase and decrease, respectively, in their use of each substance over the one-year period.

Gender Differences

I hypothesized that females would show greater declines in substance use than males from baseline to year one. To test this second outcome related to my first hypothesis, I ran an independent samples t-test to determine if there was a gender difference in overall change in substance use. Findings from the t-test did not support this hypothesis [$t(86) = -1.12, p = .27$]: males showed a mean change of -2.43 ($SD = 3.73$) and females showed a mean change of -1.42 ($SD = 4.04$). Chi-square analyses also showed no significant differences between males and females with respect to increasing, staying the same, or decreasing their use of the following substances: nicotine $\chi^2(1, N = 89) = .64, p = .724$, alcohol $\chi^2(1, N = 88) = 7.069, p = .029$, marijuana $\chi^2(1, N = 89) = 2.488, p = .288$, cocaine $\chi^2(1, N = 89) = 1.451, p = .484$, hallucinogens $\chi^2(1, N = 89) = .467, p = .792$, and benzodiazepines $\chi^2(1, N = 89) = 4.427, p = .109$. Although

the p -value for the analysis of alcohol use change and gender was less than .05, when taking into account the six cells of the crosstabs, the adjusted standardized residual would have to be greater or less than 2.64 in any individual cell. Since the maximum adjusted standardized residual observed was -2.4, there was no significant gender difference after taking these multiple comparisons into account.

Depression, Anxiety, and Stress and Changes in Substance Use

I hypothesized that participants who showed an increase in depression, anxiety, or stress over the one-year period also would show an increase in substance use. I tested this hypothesis by correlating change scores in depression, anxiety, and stress with change in overall substance use. I did not find evidence of an association between change in the negative mood variables and substance use. The correlation between the change in depression and change in substance use was nonsignificant, $r = .08$, $p = .45$; as were the correlations for anxiety, $r = .20$, $p = .06$; and for stress, $r = .16$, $p = .12$.

Living Situation and Substance Use

More than half of participants (63%, $n = 58$) reported living with their families of origin at the one-year follow up. I hypothesized that individuals living with their families of origin would be more likely to report reductions in substance use compared to those living independently. A t -test showed that participants living independently did not differ in overall reductions in substance use over the one-year period compared to those living with their families ($M_{\text{change}} = -1.77$, $SD = 3.04$ vs. $M_{\text{change}} = -1.63$, $SD = 4.41$), [$t(88) = .163$, $p = .87$]. Chi-square tests showed that participants living with their family of origin largely also were not more likely to report reductions in their 30-day substance use compared to those living independently: nicotine $\chi^2(1, N = 91) = 1.462$, $p = .49$, alcohol $\chi^2(1, N = 91) = .797$, $p = .671$, marijuana $\chi^2(1, N = 91) =$

1.572, $p = .276$, cocaine $\chi^2 (1, N = 90) = 4.654, p = .098$, and benzodiazepines $\chi^2 (1, N = 90) = 1.247, p = .536$, compared to participants living independently. Although this hypothesis was largely unsupported, participants living with their family of origin were more likely to report reducing their hallucinogen use: $\chi^2 (1, N = 90) = 6.286, p = .043$. That is, we expected about 6 participants living with their families to report a reduction in use, but 8 did.

Employment Status and Substance Use

At the one-year follow up, 84% of participants ($n = 76$) reported being employed, with more than half of them working from home (63%, $n = 57$). I hypothesized that individuals who were employed full-time would show lower rates of substance use at the one-year follow up compared to those who were unemployed. To test this hypothesis, I ran a one-way ANOVA, testing whether four employment groups (i.e., full-time, part-time, student, unemployed) differed on their combined use of seven substances (nicotine, alcohol, marijuana, cocaine, hallucinogens, opioids, and benzodiazepines) over the past year. The ANOVA showed no evidence of group differences in regard to their substance use $F(3, 87) = 1.05, p = .38$ (see Figure 5 for group means and standard errors). Therefore, this hypothesis was not supported.

Exploratory Questions

Below are key findings from my exploratory analyses examining how the COVID-19 pandemic might have affected participants' functioning.

Changes in Depression, Anxiety, and Stress During the COVID-19 Pandemic

The first exploratory analysis I ran focused on how depression, anxiety, and stress changed between baseline and one-year. Of note, the one-year measure of depression, anxiety, and stress was taken during the onset (i.e., first 1-2 months) of the COVID-19 pandemic. The mean depression score at baseline ($M = 12.10, SD = 10.50$) did not differ from mean depression

score at one-year ($M = 12.70$, $SD = 10.99$), [$t(89) = -1.097$, $p = .276$]. Compared to the cutoffs for the DASS-21 scale, our scores suggest that our means for depression at both baseline and one-year were in the mild range (Lovibond & Lovibond, 1995). However, the paired t-test showed that the means did not differ significantly. The mean anxiety score at baseline was ($M = 10.17$, $SD = 9.13$) and at one-year was ($M = 8.46$, $SD = 6.99$), [$t(90) = 1.973$, $p = .052$]. There was a trend for the mean anxiety score to decrease over the one-year period. Compared to cutoffs for the DASS-21 scales, our scores suggest that the mean baseline score for anxiety was in the moderate range, and the mean one-year score for anxiety was in the mild range (Lovibond & Lovibond, 1995). The mean stress score at baseline was ($M = 14.94$, $SD = 9.66$) and at one-year was ($M = 14.48$, $SD = 9.30$), [$t(90) = .579$, $p = .564$]. These means did not differ and both were in the normal to mild range (the normal cutoff is 14). Taken together, these exploratory analyses showed that the mean levels of participants' depression, anxiety, and stress at both baseline and one-year were somewhat higher than normative mean scores; however, participants evidenced minimal change over time, except for anxiety, which decreased slightly.

Changes in Substance Use Frequencies Within the Last 30 Days

The second exploratory analysis I ran focused on changes in substance use participants displayed within the last 30 days, which coincided with the onset of COVID-19. For tobacco and nicotine, 7.7% of participants increased use, while 25.3% of participants decreased use. The majority of participants' tobacco use remained the same, as 67% of participants reported no change in the past 30 days. Alcohol usage showed both the biggest increase and decrease of all substance use changes within the past 30 days, as 36.3% of participants reported an increase in consumption, where 30.8% of participants reported a decrease (with only 33% reporting no change in alcohol consumption within the past 30 days). 28.6% of participants reported an

increase in marijuana use, another substance showing a large increase of use, and 18.7% of participants reported a decrease. More than half of participants (52.7%) reported no change in marijuana usage within the past 30 days. A mere 2.2% of participants reported an increase in cocaine use and 11.1% reported a decrease. 3.3% of participants reported an increase in hallucinogen use, and 11.1% reported a decrease in usage. For prescription pain medication misuse, 10% of participants reported a decrease in use, where 90% reported no change in frequency of use. Regarding anti-anxiety medication misuse, 2.2% of participants reported an increase in use within the last 30 days, and 8.9% reported a decrease in use, with 88.9% reporting no change in frequency of anti-anxiety medication misuse. Figures 3 and 4 depict increases and decreases in the use of each substance during the 30 days prior to the one-year follow-up, or the onset of the COVID-19 pandemic.

Substance Use Changes in Relation to Disruptions in Employment Due to COVID-19

In order to compare changes in substance use between employment change groups, a Chi-square analysis was run. The Chi-square analysis showed whether each group's change in substance use (increase, decrease, or stayed the same) within the past 30 days was different than what would be expected by chance. Two Chi-square analyses were significant: nicotine $\chi^2(1, N = 90) = 17.789$ and marijuana $\chi^2(1, N = 90) = 18.878, p = .004$. We compared the adjusted standardized residuals from the crosstabs with established critical values for a 12-cell comparison. For nicotine, the significant Chi-square value reflects the fact that there were more people in the increased work hours group who reported a decrease in their nicotine use ($n = 5$), compared to what we expected ($n = 1.7$). For marijuana, the significant Chi-square value reflects the fact that there were fewer people in the full-time group who reported a decrease in their marijuana use ($n = 11$), compared to what we expected ($n = 5$). None of the remaining Chi-

square values were significant: alcohol $\chi^2 (1, N = 90) = 4.394, p = .624$, cocaine $\chi^2 (1, N = 89) = 10.957, p = .090$, hallucinogens $\chi^2 (1, N = 89) = 7.785, p = .254$, and benzodiazepines $\chi^2 (1, N = 89) = 5.497, p = .139$. In summary, the only substances that showed differential change by group were nicotine (increased hours group) and marijuana (full-time group). Figure 6 shows the percentage of individuals in each group who increased their use of each of the seven substances.

Discussion

The current study aimed to explore substance use trajectories amongst recent college graduates, and the factors that may be associated with their likelihood of maturing out during the first year after college. While researchers such as Cadigan et al. (2019), Lee & Sher (2018), Windle (2020), and Chen & Jacobsen (2012) examined rates of maturing out amongst emerging adults and factors impacting substance use trajectories, they did not focus on the period of time immediately following college graduation. Indeed, much of the previously existing literature is focused on emerging adulthood as a whole, rather than pinpointing specific and turbulent times of transformation within young adulthood. Furthermore, fewer studies have examined substance use trajectories of college graduates during the COVID-19 pandemic.

The findings of the present study suggested that recent college graduates' functioning was more stable than one might presume; specifically, the current study found a fair amount of stability in substance use, mental health, living situation, and employment status, even in spite of a significant life transition (i.e., leaving college) and the onset of the COVID-19 pandemic. Moreover, factors that were found to be associated with emerging adults' substance use trajectories in other studies did not evidence the same associations in our study.

Key Findings on Substance Use

The hypothesis that the frequency of all substance use (e.g., nicotine, alcohol, marijuana, cocaine, etc.) would show an overall decline over the one-year period was based on literature showing the prevalence of negative substance use trajectories with increasing age (Lee & Sher, 2018; Verges et al., 2013 Windle, 2020). This hypothesis was supported, as the overall mean change of reported substance use from baseline to one-year was negative, which is in line with findings from the aforementioned literature. While this hypothesis was supported overall due to the composite quantitative substance use variable showing a decline, the frequency analysis examining the percentage of participants who (1) increased their substance use, (2) stayed the same, or (3) decreased, showed that the most frequent response for all substances was that participants' substance use "remained the same". Many factors can influence individuals' maturing out trajectories, (e.g., the particular substance being used, changes in personality, presence of psychiatric illnesses, demographic characteristics, social role transitions, and adoption of transitional or developmental roles). For instance, Cadigan et al. (2019) found that young adults working more hours were more likely to continue substance use than those who are unemployed or working limited hours. Many individuals in our sample were fully employed at year-one, which could provide reasoning for the stability of substance use reported by participants.

The hypothesis that females would show a greater decline in substance use than males from baseline to year one was based on literature showing that it was more normative for females to mature out of substance use compared to males, and males reported higher rates of substance use during young adulthood compared to females (Chen & Jacobsen, 2012; SAMSHA, 2014). However, this hypothesis was not supported. This hypothesis may not have been supported for several reasons. First, the smaller percentage of males relative to females in the current sample

might have limited our ability to observe differences. It also is possible that a one-year time frame is not sufficient to observe differences in the rate at which substance use declines. Males and females might still occupy similar roles in their early 20s, such that most females likely are still unmarried and are not yet parents, so their substance use is not yet limited by responsibilities that accompany social role changes.

Depression, Anxiety, and Stress

The hypothesis that participants who showed an increase in depression, anxiety, or stress over the one-year period would also show an increase in substance use was unsupported, as there were no findings of association between change in the negative mood variables and substance use. This hypothesis was based on research showing that symptoms of psychiatric illnesses such as depression, anxiety, and stress have been found to be risk factors for either the initiation of substance use, or the persistence of substance use (Conway et al., 2006; Lai et al., 2015; Swendsen et al., 2010). For instance, depressive symptoms have been found to be a risk factor for the initiation of alcohol use and persistent depression has a strong association with the development of alcohol or cannabis use disorders (Goldstein et al., 2015, McCarty et al., 2012). Additionally, this hypothesis was formed based on the ample amounts of data showing that emerging adults reported the highest percentage of mental illness and substance use initiation or continuation in comparison to other age groups (CDC, 2020; Lipari, 2018). One explanation for our findings might be that substance use was impacted by alternative individual or situational factors other than negative mood states (e.g., lack of access to substances during the pandemic, less opportunity for socialization encouraging substance use). Furthermore, the hypothesis may not be supported due to the stability of reported rates of depression, anxiety, and stress, amongst

our sample from baseline to one-year. That is, given that there was limited variability in negative affect,

Living Situation

The hypothesis that individuals living with their families of origin would be more likely to report reductions in substance use compared to those living independently was largely unsupported. Individuals living with their families of origin and individuals living independently did not differ in overall substance use reductions, aside from greater reductions in hallucinogen use among those living with family as opposed to those living independently. This hypothesis was based on research showing that individuals increased their substance use while living independently or away from their families of origin. Existing literature has shown that substance use trajectories tend to increase when young adults move out of their childhood homes and into independent living situations (Cadigan et al., 2019; White et al., 2006). Furthermore, existing literature has shown that socialization can have an impactful factor on substance use, and when people live with roommates or a significant other, their alcohol use increases in comparison to living with their families. For instance, this trend of increasing substance use is seen particularly when young adults move out of their childhood homes and go to college (White et al., 2006; Cadigan et al., 2019). Furthermore, White et al. (2006) found that living with individuals who do not partake in substance use, or having fewer friends who do use substances, can be a protective factor against increasing alcohol and marijuana use. This hypothesis may not have been supported as both individuals living with their families of origin and individuals living with independently have had fewer social opportunities due to the COVID-19 pandemic. Additionally, individuals living with their families of origin may not have shown larger decreases in substance use due to the fact that they are legally allowed to drink alcohol and, in

some states, legally allowed to purchase and consume marijuana, possibly reducing the chances parents would disapprove of the consumption of these two substances. Furthermore, because participants are of age, they may have been using some substances with their parents, or their consumption of substances might be more tolerated by their parents and families.

Employment Status

The hypothesis that individuals who were employed full-time would show lower rates of substance use at the one-year follow up compared to those who were unemployed was not supported. This hypothesis was based on existing literature examining substance use trajectories by employment status. However, this literature has been contradictory. Some studies have found full-time employment to be a protective factor against persisting and increasing substance use, and that changes in employment status (such as losing a job) can pose as a risk factor for persistence of substance use (Verges et al., 2013). In contrast, other research found full-time employment to be a risk factor for continued substance use in comparison to those unemployed or employed part-time (Cadigan et al., 2019). In the current study, I found no differences in substance use change by employment group. Overall, graduates in the current study showed stability in both negative mood states and substance use, despite undergoing a lot of change within their new developmental roles (e.g., living situation, changes in employment). This stability could explain the lack of difference shown in substance use by employment group. Another possible explanation for our findings might be due to the majority of participants reported working remotely, despite employment group (full-time, part-time, or student). This might mean that graduates working full-time could have adopted similar substance use patterns to those in the unemployed or part-time employment groups because they were not subject to

some of the constraints that typically accompany in-person work, such as commuting, working out of the home, etc.

Emerging Adults' Functioning During the COVID-19 Pandemic

Because the one-year follow-up survey was administered to participants about a month after the onset of the pandemic, a series of exploratory questions were posed to explore potential effects of COVID-19 on the variables examined in the current study. The experience of a drastic life change or negative event can often lead to feelings of instability or uncertainty. Furthermore, the experience of a traumatic or negative event has been frequently associated with an increase of substance use and decline in mental health. Therefore, indicators of functioning during the pandemic were assessed to better understand graduates' substance use trajectories during a period of global strife.

Changes in Depression, Anxiety, and Stress

The first research question examined how depression, anxiety, and stress changed from baseline to one-year (about a month into the pandemic). Interestingly, the mean changes in depression, anxiety, and stress from baseline to one-year were not significant. Although there were no significant increases or decreases in depression, anxiety, and stress from baseline to one-year, the reported means were slightly elevated in comparison to normative DASS-21 scores. Depression, anxiety, and stress scores were higher than normal at both baseline and one-year (Lovibond & Lovibond, 1995), as depression was moderate at baseline and mild at one-year, anxiety was moderate at both baseline and one-year, and stress mild at both baseline and one-year. One potential explanation for these findings could be that depression, anxiety, and stress scores could have been impacted by COVID-19, as CDC data has shown a drastic increase in depression, anxiety, and stress during the pandemic and amongst young adults. While scores

remained higher than normal at baseline (while adopting developmental roles and transitioning out of college), perhaps they would have declined at one-year without the onset of the pandemic. The inability to complete developmental tasks and make the transition to a more independent lifestyle following college graduation has been known to lead to negative mood states (White et al., 2005). Therefore, the stunt of this transition that participants endured due to the onset of COVID-19 could have led to the persistence of depression, anxiety, and stress.

Substance Use Frequencies

The second research question examined participants' changes in substance use within the last 30 days (during the period of time in which the onset of COVID-19 occurred), as initial data collected during the pandemic had shown a significant increase in substance use amongst young adults (CDC, 2020). The majority of participants reported no change in tobacco, marijuana, hallucinogen, prescription pain killer, or anti-anxiety medication misuse within the past 30 days. However, alcohol and marijuana showed the biggest increases in usage during the onset of the pandemic, with 36% of participants reporting an increase in alcohol consumption, and 29% of participants reporting an increase in marijuana use. This could be due to the accessibility of these substances in comparison to the others, as liquor stores and dispensaries remained open amongst the onset of COVID-19. Additionally, the stigmas surrounding alcohol and marijuana consumption are lessened due to the legality of these substances, making consumption of them more normalized. Interestingly, alcohol also showed the biggest decreases in consumption one month into the pandemic. An explanation for this might be that while some graduates may have been using alcohol more often to cope with pandemic-related stressors, others may have decreased consumption because of fewer social opportunities or constraints posed by living with their families of origin.

Substance Use Changes in Relation to Disruptions in Employment

The last research question examined substance use changes in relation to changes in employment due to COVID-19. Due to the pandemic, many individuals have become furloughed, part-time employees, or even laid off, as changes in employment and job instability are more common than ever. Additionally, as aforementioned, changes in employment status and job instability have been found to impact substance use trajectories. Inconsistent with existing literature, there were no differences in overall substance use by employment group (full-time, part-time, student, or unemployed), as the only substances that showed differential change by group were nicotine (more people who had increased work hours decreased nicotine use than expected) and marijuana (fewer full-time employees had decreased marijuana use than expected). This suggests that job status and changes in employment were less impactful on substance use frequencies than expected.

Limitations and Future Directions

There are several limitations to this study that should be addressed. First, the sample size of the current study was small. While the initial screening survey was completed by nearly 300 people, only 103 baseline surveys were eligible, and a year later, only 91 eligible follow-up surveys were completed. Furthermore, the final sample is quite homogenous, as the surveys were sent only to graduates of two small, liberal arts colleges located in New England. Most participants were Caucasian (82%), with African American/Black, Asian/Asian Americans, Hispanic/Latino, and Bi/Multiracial participants making up less than 18% of the sample. Therefore, results of the current study are not particularly applicable to graduates on a global scale. Future studies examining substance use trajectories amongst college graduates should seek

to include a larger, more representative population of individuals on a national (or even global) scale to make results more generalizable.

Second, the current study had a lack of detailed measures of substance use. Participants were asked at baseline and one-year to estimate the number of times they had used each substance in the past year (and how many times within the past 30 days at the one-year follow up survey) and respond using a 7-point scale. The response options on the scale were wide, ranging from “never” (1) to “40 or more times” (7). The wide gaps between response options on the Likert scale may it more challenging to assess actual frequency of substance use, particularly if someone was using heavily. Additionally, asking participants to recall how many times they had used a substance within the past year is a large range of time to recall upon, making it difficult for individuals to accurately estimate. Furthermore, at one year, participants were asked to indicate the extent to which their substance use had changed, if at all, within the last 30 days, and respond on a 3-point scale, ranging from “increased” (1), “remained about the same” (2), to “decreased” (3). The ability to recall whether one’s frequency of substance use had changed within the past year compared to the last 30 days is also susceptible to inaccurate recollection.

Lastly, the scale used to measure depression, anxiety, and stress (the DASS-21) did not capture psychological functioning throughout the whole year. The DASS asks participants to recall symptoms of depression, anxiety, and stress within the past week, rather than throughout the entire duration of the study. Therefore, it is possible that reported symptoms were not entirely or accurately representative of the negative mood states experienced throughout the study.

Future research should work to further investigate substance use trajectories amongst college graduates, in addition to the effects that COVID-19 has had on this subset of young adults. More specifically, future research should aim to focus on the specific period of time

within young adulthood that follows college graduation and entrance into the workforce. It would be interesting for future research to further examine the effects that remote work can have on substance use patterns amongst young adults on a larger, more generalizable population of graduates. Furthermore, more research is needed to determine substance use trajectories and their relations to employment status (and the adoption of other transitional roles), as current literature is often contradicting on this matter.

Additionally, future research could examine the specific factors that prompted the increases or decreases in alcohol and marijuana during COVID-19, specifically examining coping skills that individuals have used throughout the pandemic. Because the pandemic is still ongoing and COVID-19 research is in its infancy, there is much more work to be done. While the current study used longitudinal data beginning in 2019, only 30 days of the pandemic were captured in the results. Variables examined in the current study might have progressed differently as the pandemic continued for a much longer duration of time, and future research should examine substance use trajectories, negative mood states, employment status, and effects of quarantine further along into COVID-19. Two-year follow up data collected by the current study's surveys will better capture the trajectories of the variables examined.

Implications

The current study aimed to contribute to the extensive body of research examining substance use trajectories amongst young adults by proposing a variety of factors that might impact rates of maturing out specifically following college graduation. Moreover, findings of the current study added to the knowledge of maturing out of substance use and the variety of factors that can have an impact on the substance use trajectories of young adults. Although CDC data regarding young adults, substance use, and mental health is concerning, participants in the

current study, or graduates from small liberal arts colleges, seemed to show more resilience than the general young adult population. This suggests that there are large gaps in substance use (and mental health) within emerging adults, with respect to how subgroups are functioning. However, said resilience might not have been present without the onset of the pandemic, as it is unknown if the current study's sample would have reported less negative effect than the general population of emerging adults. Factors that might have contributed to this sample's resilience might include socioeconomic status, education level, as all participants attended and graduated from prestigious New England colleges. It would be interesting to further examine what factors might have contributed to the apparent resilience of these recent college graduates.

In addition to better understanding the factors that made this subgroup of emerging adults more resilient to increasing substance use and negative mood states, is important to note the reported increases of alcohol and marijuana during the onset of the pandemic. Young adults, specifically college graduates, should be examined more frequently by healthcare providers for signs of potential substance misuse, especially during (and directly following) the pandemic. Furthermore, such findings could be used by healthcare providers to suggest alternative ways of coping with life stressors, and overall awareness and education on alcohol and marijuana use should be advertised to the young adult population. Additionally, the current study found that the majority of fully employed individuals reported working from home. Future studies should examine how people have navigated working remotely, and whether remotely working has had an impact on individuals' mental health and substance use trajectories. Lastly, future research should examine the impact that transitioning from remote work to non-remote work and transitioning from living in a childhood home after graduation to living independently can have on young adults' substance use trajectories and psychological wellbeing.

In conclusion, understanding substance use trajectories of college graduates is not only useful for further establishing more specific maturing out patterns, but also for understanding and predicting individuals' levels of overall functioning (e.g., health, occupation, and social outcomes). By gaining a better understanding of the factors that affect college graduates' substance use trajectories', we can formulate more creative ways to support the people in this developmental stage, to help them feel more settled, secure, and comfortable with the unsettling feelings that tend to accompany this turbulent time.

References

- Berenz, E. C., McNett, S., Rappaport, L. M., Vujanovic, A. A., Viana, A. G., Dick, D., & Amstadter, A. B. (2019). Age of alcohol use initiation and psychiatric symptoms among young adult trauma survivors. *Addictive Behaviors, 88*, 150–156.
<https://doi.org/10.1016/j.addbeh.2018.08.022>
- Blume, A. W., Rudisill, D. M., Hendricks, S., & Natalia, S. (2013). Disease model. Miller, P.,(eds) *Comprehensive Addictive Behaviors & Disorders, Volume 1: Principles of Addiction*.
- Breslau, N., Novak, S. P., & Kessler, R. C. (2004). Daily smoking and the subsequent onset of psychiatric disorders. *Psychological Medicine, 34*(2), 323–333.
<https://doi.org/10.1017/S0033291703008869>
- Cadigan, J. M., Duckworth, J. C., Parker, M. E., & Lee, C. M. (2019). Influence of developmental social role transitions on young adult substance use. *Current Opinion in Psychology, 30*, 87–91. <https://doi.org/10.1016/j.copsyc.2019.03.006>
- CDC report on mental health in pandemic 2020.pdf*. (n.d.). Retrieved November 8, 2020, from https://drive.google.com/file/d/1KAI_kvdmAkrneu1Ofq2zp5BFU4QCtQSZ/view?usp=sharing&usp=embed_facebook
- Chen, P., & Jacobson, K. C. (2012). Developmental trajectories of substance use from early adolescence to young adulthood: Gender and racial/ethnic differences. *The Journal of Adolescent Health, 50*(2), 154–163. <https://doi.org/10.1016/j.jadohealth.2011.05.013>
- Conway, K. P., Compton, W., Stinson, F. S., & Grant, B. F. (2006). Lifetime comorbidity of DSM-IV mood and anxiety disorders and specific drug use disorders: results from the

- National Epidemiologic Survey on Alcohol and Related Conditions. *The Journal of Clinical Psychiatry*, 67(2), 247–257. <https://doi.org/10.4088/JCP.v67n0211>
- Czeisler, M. É. (2020). Mental health, substance use, and suicidal ideation during the COVID-19 Pandemic—United States, June 24–30, 2020. *MMWR. Morbidity and Mortality Weekly Report*, 69. <https://doi.org/10.15585/mmwr.mm6932a1>
- Goldstein, R. B., Chou, S. P., Smith, S. M., Jung, J., Zhang, H., Saha, T. D., Pickering, R. P., June Ruan, W., Huang, B., & Grant, B. F. (2015). Nosologic comparisons of DSM-IV and DSM-5 alcohol and drug use disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions—III. *Journal of Studies on Alcohol and Drugs*, 76(3), 378–388. <https://doi.org/10.15288/jsad.2015.76.378>
- Jemberie, W. B., Stewart Williams, J., Eriksson, M., Grönlund, A.-S., Ng, N., Blom Nilsson, M., Padyab, M., Priest, K. C., Sandlund, M., Snellman, F., McCarty, D., & Lundgren, L. M. (2020). Substance use disorders and COVID-19: Multi-faceted problems which require multi-pronged solutions. *Frontiers in Psychiatry*, 11. <https://doi.org/10.3389/fpsy.2020.00714>
- Kandel, D. B., & Raveis, V. H. (1989). Cessation of illicit drug use in young adulthood. *Archives of General Psychiatry*, 46(2), 109–116. <https://doi.org/10.1001/archpsyc.1989.01810020011003>
- Kerr-Corrêa, F., Igami, T. Z., Hiroce, V., & Tucci, A. M. (2007). Patterns of alcohol use between genders: A cross-cultural evaluation. *Journal of Affective Disorders*, 102(1), 265–275. <https://doi.org/10.1016/j.jad.2006.09.031>
- Labouvie, E. (1996). Maturing out of substance use: Selection and self-correction. *Journal of Drug Issues*, 26(2), 457–476. <https://doi.org/10.1177/002204269602600208>

- Lai, H. M. X., Cleary, M., Sitharthan, T., & Hunt, G. E. (2015). Prevalence of comorbid substance use, anxiety and mood disorders in epidemiological surveys, 1990-2014: A systematic review and meta-analysis. *Drug and Alcohol Dependence, 154*, 1–13. <https://doi.org/10.1016/j.drugalcdep.2015.05.031>
- Lee, J. Y., Brook, J. S., & Kim, W. (2018). Triple trajectories of alcohol use, tobacco use, and depressive symptoms as predictors of cannabis use disorders among urban adults. *Psychology of Addictive Behaviors, 32*(4), 466–474. <https://doi.org/10.1037/adb0000373>
- Lee, M. R., Ellingson, J. M., & Sher, K. J. (2015). Integrating social-contextual and intrapersonal mechanisms of “maturing out”: joint influences of familial-role transitions and personality maturation on problem-drinking reductions. *Alcoholism, Clinical and Experimental Research, 39*(9), 1775–1787. <https://doi.org/10.1111/acer.12816>
- Lee, M. R., & Sher, K. J. (2018). “Maturing Out” of Binge and Problem Drinking. *Alcohol Research : Current Reviews, 39*(1), 31–42.
- Lev-Ran, S., Roerecke, M., Le Foll, B., George, T. P., McKenzie, K., & Rehm, J. (2014). The association between cannabis use and depression: A systematic review and meta-analysis of longitudinal studies. *Psychological Medicine, 44*(4), 797–810. <https://doi.org/10.1017/S0033291713001438>
- Lipari, R. N. (2018). *Key Substance Use and Mental Health Indicators in the United States: Results from the 2018 National Survey on Drug Use and Health*. 82.
- Littlefield, A. K., Sher, K. J., & Wood, P. K. (2009). Is “maturing out” of problematic alcohol involvement related to personality change? *Journal of Abnormal Psychology, 118*(2), 360–374. <https://doi.org/10.1037/a0015125>

- Liu, X., Liu, J., & Zhong, X. (2020). *Psychological State of College Students During COVID-19 Epidemic* (SSRN Scholarly Paper ID 3552814). Social Science Research Network.
<https://doi.org/10.2139/ssrn.3552814>
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335–343.
[https://doi.org/10.1016/0005-7967\(94\)00075-U](https://doi.org/10.1016/0005-7967(94)00075-U)
- McCarty, C. A., Wymbs, B. T., King, K. M., Mason, W. A., Stoep, A. V., McCauley, E., & Baer, J. (2012). Developmental consistency in associations between depressive symptoms and alcohol use in early adolescence. *Journal of Studies on Alcohol and Drugs*, 73(3), 444–453. <https://doi.org/10.15288/jsad.2012.73.444>
- Overbeek, G., Vollebergh, W., Engels, R. C. M. E., & Meeus, W. (2003). Young adults' relationship transitions and the incidence of mental disorders: A three-wave longitudinal study. *Social Psychiatry and Psychiatric Epidemiology*, 38(12), 669–676.
<https://doi.org/10.1007/s00127-003-0689-1>
- Schepis, T. S., Buckner, J. D., Klare, D. L., Wade, L. R., & Benedetto, N. (2020). Predicting college student prescription stimulant misuse: An analysis from ecological momentary assessment. *Experimental and Clinical Psychopharmacology*.
<https://doi.org/10.1037/pha0000386>
- Swendsen, J., Conway, K. P., Degenhardt, L., Glantz, M., Jin, R., Merikangas, K. R., Sampson, N., & Kessler, R. C. (2010). Mental disorders as risk factors for substance use, abuse and dependence: Results from the 10-year follow-up of the National Comorbidity Survey. *Addiction*, 105(6), 1117–1128. <https://doi.org/10.1111/j.1360-0443.2010.02902.x>

- Vergés, A., Haeny, A. M., Jackson, K. M., Bucholz, K. K., Grant, J. D., Trull, T. J., Wood, P. K., & Sher, K. J. (2013). Refining the notion of maturing out: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *American Journal of Public Health, 103*(12), e67. <https://doi.org/10.2105/AJPH.2013.301358>
- White, H. R., Beardslee, J., & Pardini, D. (2017). Early predictors of maturing out of marijuana use among young men. *Addictive Behaviors, 65*, 56–62. <https://doi.org/10.1016/j.addbeh.2016.09.007>
- White, H. R., Labouvie, E. W., & Papadaratsakis, V. (2005). Changes in substance use during the transition to adulthood: A comparison of college students and their noncollege age peers. *Journal of Drug Issues, 281–306*.
- White, H. R., McMorris, B. J., Catalano, R. F., Fleming, C. B., Haggerty, K. P., & Abbott, R. D. (2006). Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. *Journal of Studies on Alcohol, 67*(6), 810–822. <https://doi.org/10.15288/jsa.2006.67.810>
- Wilens, T. E., Martelon, M., Joshi, G., Bateman, C., Fried, R., Petty, C., & Biederman, J. (2011). Does ADHD Predict substance-use disorders? A 10-year follow-up study of young adults with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry, 50*(6), 543–553. <https://doi.org/10.1016/j.jaac.2011.01.021>
- Windle, M. (2020a). Maturing out of alcohol use in young adulthood: latent class growth trajectories and concurrent young adult correlates. *Alcoholism: Clinical and Experimental Research, 44*(2), 532–540. <https://doi.org/10.1111/acer.14268>

Windle, M. (2020b). Sex differences in substance use from adolescence to young adulthood:

Tests of increases in emergent adulthood and maturing out in later young adulthood.

Drug and Alcohol Dependence, 207, 107813.

<https://doi.org/10.1016/j.drugalcdep.2019.107813>

Table 1*Demographic and Psychosocial Characteristics at Baseline and One-Year*

Study variable	Baseline <i>N</i> = 103	One year <i>n</i> = 91
Age (<i>M, SD</i>)	(21.96, 1.51)	---
% Female	65%	---
% Male	33%	---
% Gender non-conforming or gender fluid	2%	---
Race/ethnicity		
White	82%	---
African American/Black	3%	---
Asian/Asian American	7%	---
Hispanic/Latino	5%	---
Bi/Multiracial	3%	---
Employment status		
Employed full time	---	74%
Employed part time	---	7%
Graduate student	---	11%
Unemployed	---	9%
Greek-life involvement in college	58%	---
Living situation		
With family	---	63%
Independent	---	37%
DASS-21 scales (<i>M, SD</i>)		
Depression	(12.10, 10.50)	(12.70, 10.99)
Anxiety	(10.17, 9.13)	(8.46, 6.99)
Stress	(14.94, 9.66)	(14.48, 9.30)
Substance use (% reporting any use)		
Nicotine	76%	70%
Alcohol	97%	97%
Marijuana	91%	80%
Cocaine	40%	24%
Hallucinogen	23%	17%
Prescription pain medication	8%	3%
Prescription anxiety medication	19%	9%

Note. Percentages reporting pain and anxiety medication use represent the percentage of people using these medications in a way they were not prescribed. Percentages for employment status add up to greater than 100 due to rounding.

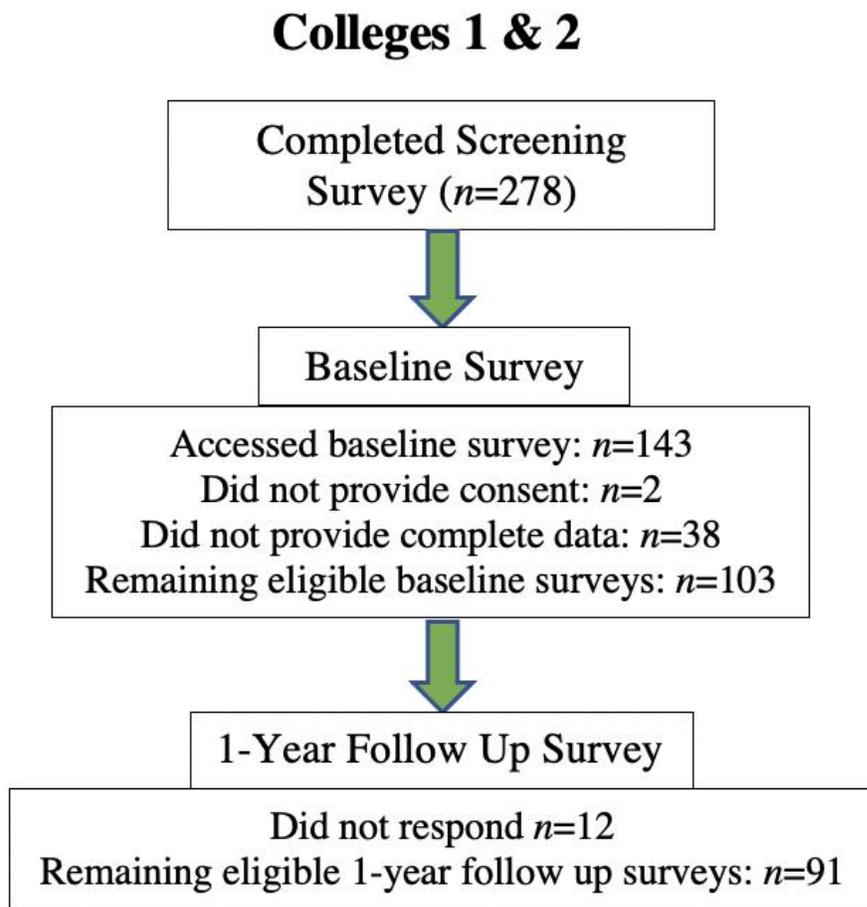
Figure 1*Participant Flow from Baseline to One-Year Follow-Up*

Figure 2

Changes in Employment at the Onset of the COVID-19 Pandemic

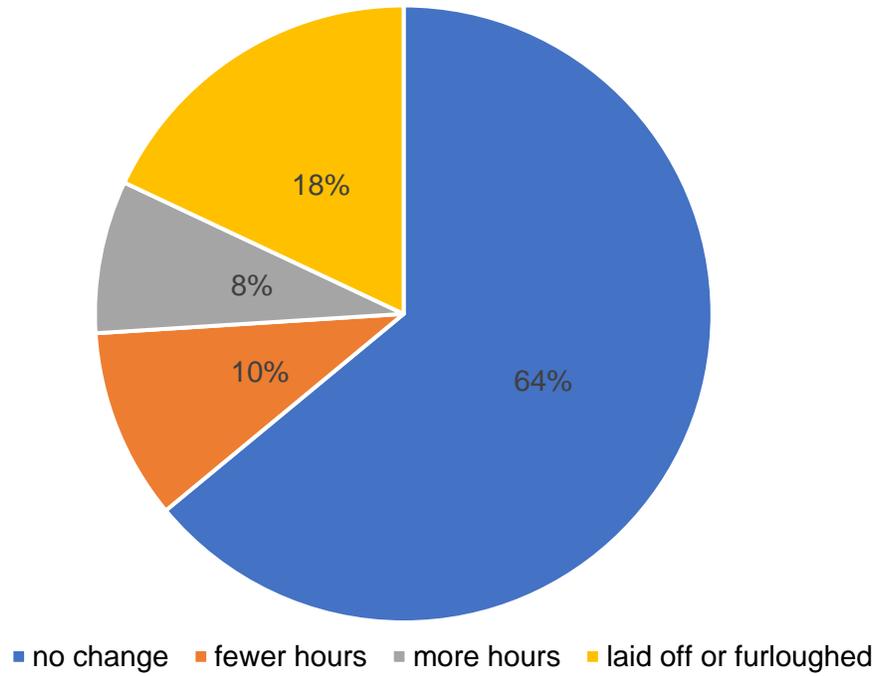


Figure 3

Increase in the Use of Various Substances Over Previous 30 Days and One Year

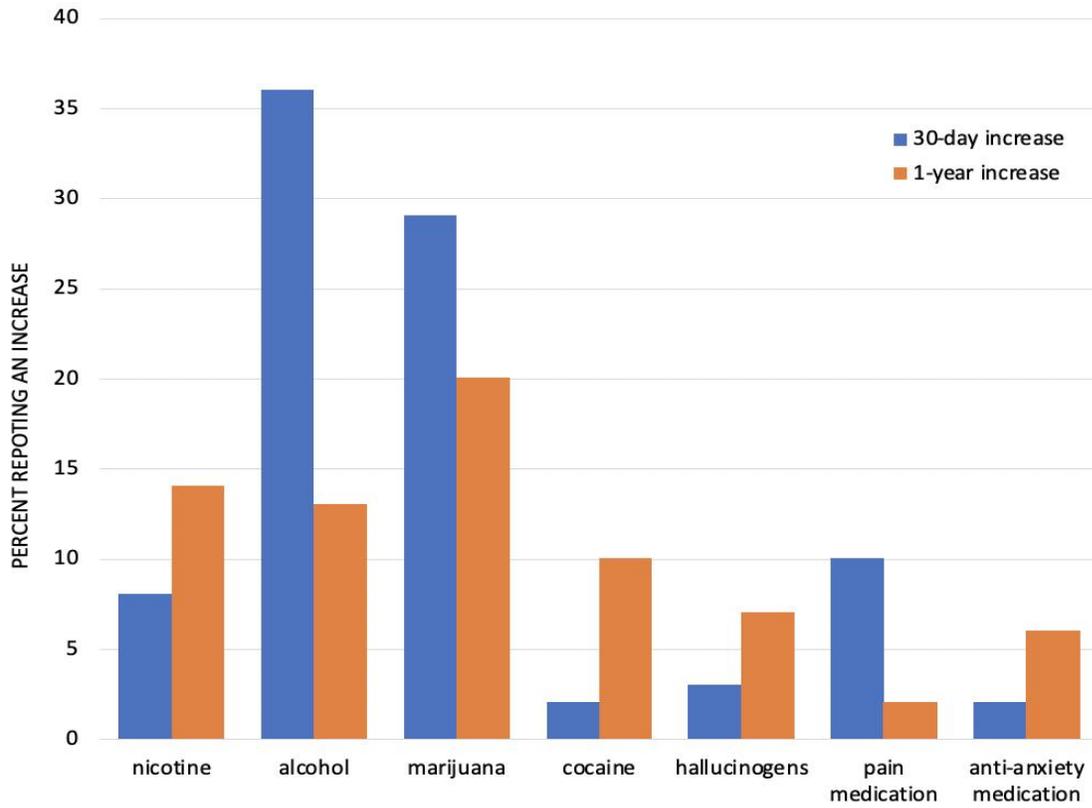


Figure 4

Increase in the Use of Various Substances Over Previous 30 Days and One Year

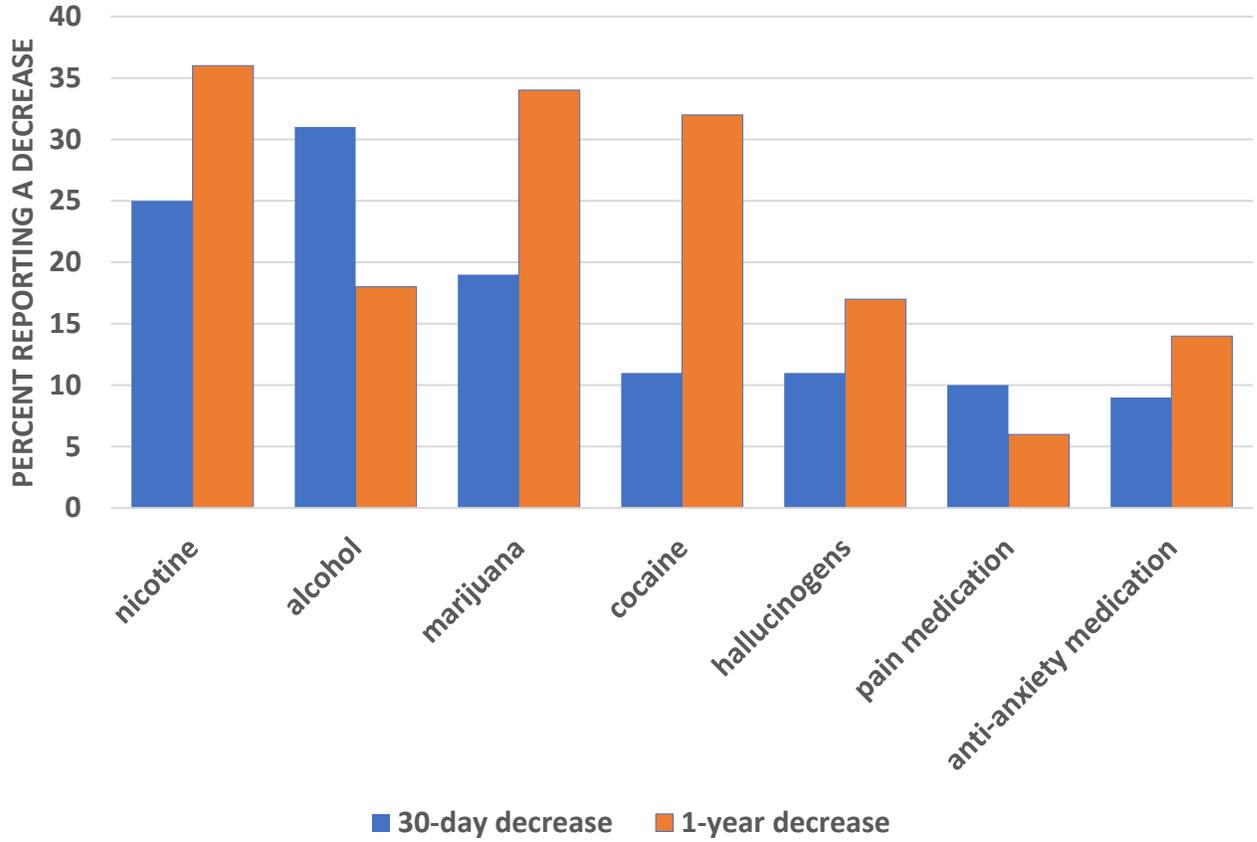
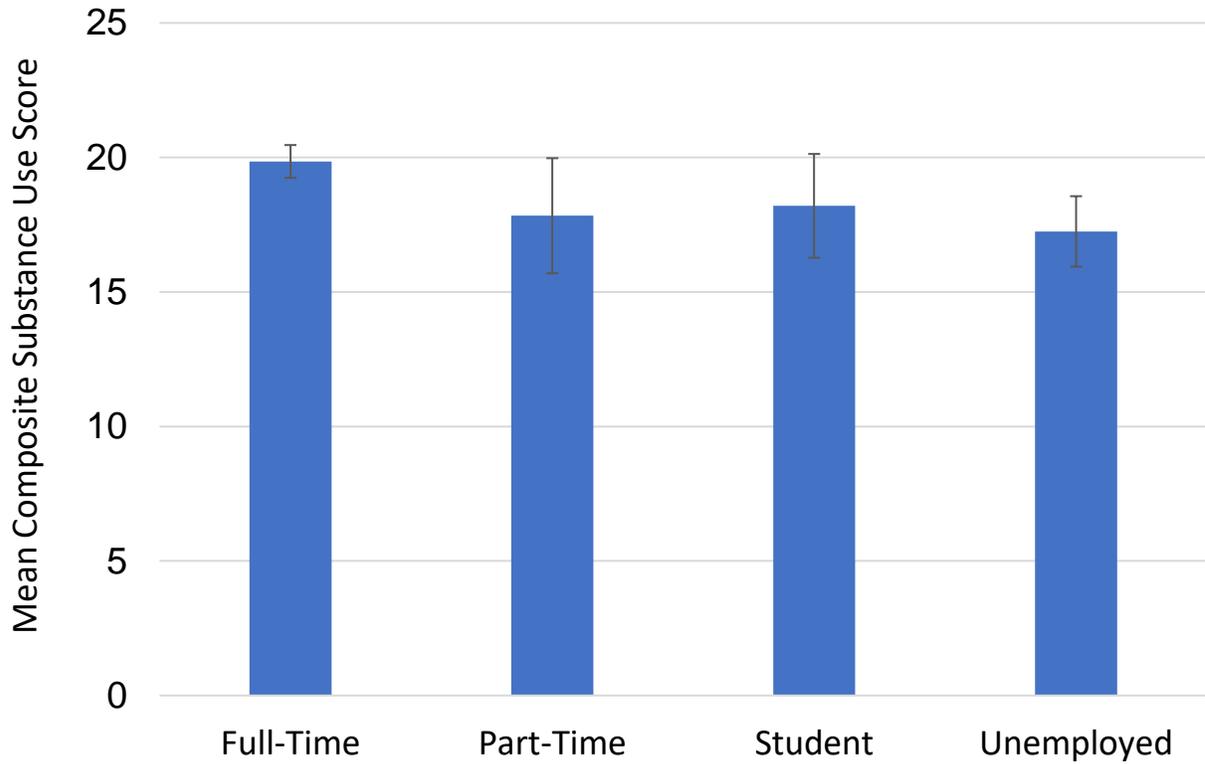


Figure 5

Past-Year Substance Use by Employment Group



Note. Substance use was a composite of seven different substances (alcohol, marijuana, tobacco/nicotine, cocaine, hallucinogens, prescription anxiety, and prescription opioid misuse).

Figure 6

Increased Substance Use by Employment Change due to COVID-19

