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Population Demographics: Predictors of the Relationship Between Alcohol Use Disorder and Major Depression

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ABSTRACT

This thesis examines both biological and social explanations of alcohol use disorder (AUD) and major depression (MD) through a thorough review of current literature. Using multiple logistic regression analyses exploring the sociodemographic and alcohol use factors that contribute to reporting of major depression symptoms with data from the 2017 National Survey on Drug Use and Health, this thesis demonstrates how there are health disparities that exist among different demographic populations. Specifically, certain demographic characteristics such as racial or ethnic identity, gender, and socioeconomic status may contribute to increased risk of developing and reporting episodes of lifetime and past year major depression. This thesis also examines current substance use treatment and intervention programs and concludes with the argument that a holistic intervention addressing the biological, psychological, and social consequences and factors contributing to MD and AUD is not only important but also necessary.

Keywords: psychology, alcohol, addiction, depression

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INTRODUCTION

Alcohol use disorder (AUD) and major depression (MD) are often examined through a medicalized lens in which researchers attempt to find biological and pathological explanations for these conditions. Biological explanations for understanding AUD and MD are fruitful for trying to understand the mechanisms through which these conditions manifest and operate. With regard to growing rates of AUD among the U.S. population, there has been greater concern and calls for more effective treatment and intervention programs. For example, Surgeon General Jerome Adams recently called for new strategies to address rising rates of AUD and has praised the success of some local and state intervention programs. However, the Surgeon General also has noted that "only individuals with the most severe substance use disorders have received treatment" and that "most specialty substance use disorder treatment programs are not part of, or affiliated with, mental or physical health care organizations" (U.S. Department of Health &Human Services, 2019). This statement by the Surgeon General points to a gap in treatment and intervention programs that aim to help individuals with both AUD and other mental health conditions, such as MD.

Although the medicalization of alcohol use and addiction has led to advances in pharmacology, researchers still posit that disconnects between research and practical implementation continue to exist that lead to disparities in biological, mental, and behavioral healthcare. The gap between diagnosis and treatment warrants further investigation by both academic researchers, clinicians, and practitioners. There is also a definitional gap in the application of the term addiction in the pain management side of medicine.

Without a clear-cut definition of addiction, there is "contemporary conceptual chaos" regarding what is therefore to be considered substance "abuse" (Fisanick, 2009, p. 23). For

example, there does not appear to be a consensus among clinicians and social policy makers as to where the boundary between substance use and substance abuse exists. Consequently, administrators and clinicians running addiction treatment programs face decisions regarding distinguishing substance users from abusers and those who are substance-dependent. As a result, unnecessary hospitalizations, increased medical costs, and a distrust among health care providers can occur (Fisanick, 2009). These financial costs can have serious consequences for society as evidenced by the over $120 billion annual cost of alcohol abuse in the United States. This figure includes (1.) direct costs for treatment and medical care for alcohol-related illnesses and injuries, and (2.) indirect costs associated with crime and violence, property losses due to automobile and other accidents, and losses of productivity from alcohol-related morbidity and mortality (Moos, Finney, & Cronkite, 1990). In today's economy, according to the Atlanta-based Centers for Disease Control and Prevention (CDC), heavy drinking costs society, industry, the government, and the U.S. taxpayer an estimated at $249 billion each year (2019). But more importantly, due to the persistence of ambiguous and elusive terminology, patients ultimately are failing to be properly diagnosed and to receive proper treatment.

Other areas of research are aimed at understanding the biological connections between AUD and MD in efforts to develop medicalized treatment programs that treat both conditions; yet, these medicalized programs often do not address the causes of these problems. Instead, these treatment programs often mask or mitigate symptoms as opposed to truly addressing the cause of the condition. Additionally, these types of medicalized treatment programs, in which individuals are prescribed pharmaceutical drugs to either lesson desire for substances or to relieve their depressive symptoms, often do not fully take into account differences among the populations they are treating. There are also differences in demographic representations in AUD studies. For

example, more research focuses on the recruitment and studying of white males than other racial or gender categories (McCaul et al., 2019). As a result of such research bias, treatment programs are often tailored more toward the white male demographic, even though, for example, the rate of females being diagnosed with AUD is steadily increasing. In consideration of the fact that females face significantly more barriers in accessing substance use and mental health treatment facilities and programs (Tuchman, 2010), it becomes even more important that researchers are taking into account the experiences of these populations.

Additionally, there are differences in the prevalence of AUD and MD among various racial and ethnic groups, where there may be greater or lesser stigmatization of mental health issues and substance use issues. To address these issues requires that both researchers and community agencies understand the social mechanisms through which individuals may seek medicalized professional help. Researchers often address the issues of racial and ethnic gaps in health and well-being, particularly with regard to substance use and mental health conditions; yet, there is significantly less literature that discusses how to create best practices for treating AUD and MD that may be more culturally aware and appropriate. Although it is important to understand the broader patterns and trends that emerge in examining mental health and substance use disorders, it is equally important to understand the circumstances in which individuals feel comfortable in seeking treatment. This type of understanding requires moving beyond a narrow biological framework.

Furthermore, there is a paucity of literature that addresses how certain sociodemographic characteristics should contribute to the design of treatment programs for those with MD and AUD. For example, many substance use treatment and intervention programs are very costly, creating greater economic stress for those who are uninsured or underinsured. Although mental

health services are often covered by insurance costs, there are also instances where individuals must pay out-of-pocket for mental health care. For individuals with AUD or MD, or both, who may not have insurance and cannot pay the out-of-pocket costs, seeking professional medicalized treatment may not be an option (Stewart & Horgan, 2011). Other types of intervention programs, such as Alcoholics Anonymous or Narcotics Anonymous, may not be options either for individuals who cannot access the facilities where meetings are held (Sissam & Hallams, 2009). Current substance use and mental health treatment and intervention programs should consider the various clientele who may be seeking their health services. While many researchers who identify wealth and health disparities are able to contribute to substance use and mental health treatment agencies, I argue that there could be greater translation between academic research findings and implementation of treatment practices that are informed by those findings.

LITERATURE REVIEW

Biological Frameworks of Alcohol Use

Current literature on alcohol use disorder and major depression often frames these issues within biological and pathological perspectives. While research has supported the notion that alcohol does affect the brain, the main problem in diagnosis and treatment has been to identify and distinguish actual lesions caused directly by alcohol from lesions caused by other common alcohol-related factors such as a thiamin deficiency (Harper, 1998). In order to explore the nature of the relationship between the brain and alcohol, Harper (1998) looked at a group of uncomplicated alcoholics (those who drink more than 80 grams of alcohol a day) and compared them with a control group (those who do not drink alcohol) and found that there was significant brain shrinkage, a common marker of brain damage by loss of brain tissue, in the uncomplicated

alcoholics group. Shear, Jernigan, and Butters (1994), however, note that loss of white matter in brain tissue can be reversed with sustained abstinence.

More recently, researchers have found that alcoholics experience global loss of brain volume in the frontal cortex (Crews & Vetreno, 2014). While there can be some brain structure recovery with long periods of abstinence, the brain is vulnerable to being damaged again during a relapse, as evidenced by examining white matter volume among relapsers (Pfefferbaum et al., 1995). Research also reveals inconsistent gender differences in structure and neurocognition among chronic alcohol users (Hommer, 2003). Jacobson (1986) and Man et al. (1992) found that alcoholic men and women had significantly larger amounts of intracranial CSF than non-alcoholic subjects, suggesting brain shrinkage; however, women experienced greater brain shrinkage, implying that the central nervous system (CNS) in women is more vulnerable to alcohol-induced damage than in men (Hommer, 2003). However, unlike Pfefferbaum et al. (1993), who found that the cerebral ventricles in the brain were larger in alcoholic women than in nonalcoholic women, Kroft and colleagues (1991) were unable to detect a comparable difference. As a result, researchers concluded that brain size may not be a key factor to investigate when studying alcohol and gender; however other scholars suggest that age is a factor affecting gender differences in brain structure when examining alcohol use (Gur et al, 2002; Xu et al. 2000).

Biological, genetic, and pathological perspectives also highlight that alcohol abuse can involve both genetic component and behavioral components (Mohammad, 2016). While research has highlighted environmental risk factors for AUD, such as the availability of alcohol, pressure to drink, and life stressors, there is evidence that alcoholism tends to run in families. Adoption studies have helped to disambiguate familial environments from genetics and have found that the

risk for alcoholism in adoptees is better correlated with their biological parents than with their adoptive parents, providing evidence for genetic influence (Edenberg & Foroud, 2014). There are, however, only a small number of genes that have been implicated in the genetic risk for alcoholism, indicating that further research is warranted (Edenberg & Foroud, 2014).

Although research provides important insight into the biological effects of chronic alcohol consumption, there is a significant gap between what researchers and experts know about clinical and laboratory evidence and more real world, social scientific research in interventions. For example, in 1999, there were reports indicating that naltrexone (an opioid antagonist that blocks the reward effects of alcohol consumption) and acamprosate (sold under the brand name, Campral or Naloxone) that treats alcohol dependence by blocking NMDA receptors and reducing unpleasant feelings could be effective in the treatment of alcoholism. However, from a pharmacological perspective, the researchers also concluded that treatment for alcohol dependence should continue to incorporate biopsychosocial interventions in order to change the pattern of addiction and to improve addicts' physical, mental, and social health (Garbutt, West, Carey, Lohr, & Crews, 1999).

The biopsychosocial perspective also reveals that women respond to alcohol biologically differently than men, suggesting that current treatment plans are not as effective for women. Furthermore, women who are heavy drinkers face greater social stigmatization because social expectations for women are linked to roles such as caregivers, wives, and mothers (Rolfe, Orford, & Dalton, 2009). Additionally, stress and underlying mental illness has a significant outcome when considering women and alcohol. Cooper et al. (1992) found that women who heavily consume alcohol generally tend to internalize their feelings, leading to higher incidences of anxiety and depression in alcoholic women than in alcoholic men. Similarly, alcoholic women

are often linked with other diagnoses including "mania, somatization, major depression, panic disorder, and phobic disorders" (Beckman, 1994) while alcoholic men tend to have more antisocial behaviors (Lex, 1994). Women are also more likely to report drinking as a defensive mechanism to escape crises or situations, which suggests that their sense of powerlessness overshadows their abuse of alcohol (Van Der Walde, Urgenson, Weltz, & Hanna, 2002). Generally, women who abuse alcohol represent a heterogeneous group, suggesting there is no single intervention strategy that is effective (Van Der Walde et al., 2002).

With regard to programs such as Alcoholics Anonymous (A.A), Mohammad (2016) argues that they are not qualified to treat people effectively who suffer from alcohol addiction. Mohammad further argues that rehabilitation strategies must acknowledge that there are three intersecting modalities: biomedical, psychological, and sociocultural. His research demonstrates that A.A. lacks the biomedical and psychological components (pg. 94-5). This perhaps is because they are not medical programs aligned with clinics and hospitals. In summary, researchers conclude that alcoholism should incorporate a biopsychosocial perspective in order to positively alter the lifestyle of the alcoholic (Garbutt, et al., 1999).

Demographics of AA Attendance

Epidemiological analyses in the general population of the United States indicate demographic differences among those who attend AA or AA-related recovery programs. Tonigan, Connors, and Miller (1998) found that African-Americans and Hispanics were more likely to recommend AA affiliation for alcohol-related problems while Caetano (1993) noted that the proportion of people among the general population who were likely to attend AA was greater among Hispanics (12%) than among African-Americans (5%) or Whites (5%). Humphreys and Moos (1996), however, found no ethnic preferences as to whether clients selected formal

outpatient treatment or AA. Additionally, Humphreys and Moos (1996) found that women and men attended AA at similar rates and similarly practiced specific AA-behaviors, and they were alike on most factors associated with AA participation and abstention across time including abstinence goal, drink volume, negative consequences, prior treatment, and encouragement to reduce drinking. Although the gender gap has been gradually closing between men and women in seeking recovery in AA, young members of either gender remain a minority (Sander, 2019). Compared to men, women who have a higher Addiction Severity Index (ASI) drug severity were less likely to participate in AA (Witbrodt & Delucchi, 2011).

Link Between AUD and Major Depression

Major Depression has also been presented as a medicalized, genetic, and epidemiologic issue. For example, in order to find patterns of association for depression and Substance Use Disorder (SUD), Swendsen and Merikangas (2000) examined evidence from clinical, epidemiological, and genetic epidemiological studies, finding that the most tenable explanation is that alcoholism may serve as a source of life stress or as a biological toxin that leads to depression, and that alcoholism, therefore, may lead to severe damage to health and social behavior, which in turn influences the etiology of depression. In addition, prolonged alcohol use may advance symptoms of depression (Schuckit & Hesselbrock, 1994). Based on findings like these, we can see that there may be a causal association between alcoholism and depression (Swendsen & Merikangas, 2000).

Other studies have also examined the comorbidity between Alcohol Use Disorder and Major Depression. For example, in a study of the National Longitudinal Alcohol Epidemiologic Survey (NLAES), Grant and Harford (1995) found that comorbidity of alcohol use disorder (AUD) and major depression (MD) is pervasive in the general population and found that the

association between alcohol abuse and major depression was consistently greater for females and Blacks, compared to their male and non-black counterparts. Grant and Harford also argue that significant associations between alcohol abuse and major depression for the subgroups of females and Blacks suggests that intervention and treatment programs should be tailored and managed to those demographic populations that might have specific needs.

Brook, Brook, and Zhang (2002) used the Michigan Composite International Diagnostic Interview to examine influences of drug use and MD on adolescents and young adults. Their results suggest that early drug use is linked to, and predictive of, future psychiatric disorders starting in the late 20s. In a study examining long-term development of comorbidity between MD and AUD in 816 participants, Brière, Rohde, Seeley, Klein, and Lewinsohn (2014) found that comorbidity was low in adolescence, the rate increased into early adulthood and adulthood, and individuals with a history of either MD or AUD generally had the other disorder as well, except for women with MD. Zierau, Bille, Ruz, and Bech (2002) compared the Gotland Male Depression Scale to the Major Depression Inventory in 87 male patients who were being treated for alcohol dependency and found that 39% of the patients had probable or definite depression and should also be considered for treatment with antidepressants.

While the biological framework is important in diagnosing and treating symptoms of both AUD and MD, it is equally important to understand the sociodemographic factors that contribute to the prevalence of these issues with certain populations. For example, AUDs are among the most common and undertreated mental disorders in developed countries (Rehm et al., 2015). According to the DSM-5, in 2012-2013, 36.0% of males and 22.7% of females in the United States met criteria for AUD at some point of their lives, and the disorder has been shown to be most prevalent in young adulthood (ages 18-29). Alcohol consumption is causally linked to 60

different diseases (Roerecke & Rehm, 2014), and people with AUD account for around half of all the alcohol-related harm documented in developed societies (Rehm et al, 2010). While mild forms of AUD often remit without treatment, Mitchell et al. (2012) argue that roughly half of all individuals with AUD may remain undiagnosed if doctors rely only on clinical, biological, or physiological markers of addiction for diagnosis. This anomaly raises the question of whether the system for classifying people who potentially have an AUD is flawed, or whether the criteria for placing individuals with an AUD need to be redefined.

Based on previous longitudinal and cross-sectional studies, Boden and Fergusson have offered evidence that suggests that there is a moderately strong association between AUD and MD (2011). They offer two explanations for this association: either AUD and MD are caused by some common underlying genetic or environmental factors that enhance the risk of both of these disorders, or AUD and MD have a causal relationship. Some important explanations for the causal link between AUD and MD include an individual's demographics such as gender, age race, and social and economic circumstances (Collins, 2016; Torvik, Rosenström, Ystrom et al., 2017). Current research examining AUD and MD suggests that a biopsychosocial model of alcoholism and depression warrants further investigation and that doing so may lead to improved recovery and treatment programs.

Research Question

The question guiding the thesis is: What are the sociodemographic and alcohol use factors that contribute to differences in reporting of lifetime and past year major depressive episodes?

METHODS

Sampling and Interviewing

This thesis uses the 2017 National Survey on Drug Use and Health (NSDUH) to examine the various sociodemographic and alcohol use factors that influence both lifetime major depressive episodes (MDE) and MDEs occurring in the past year. The NSDUH is under the direction of the Substance Abuse and Mental Health Services Administration (SAMHSA), which is a federal agency in the U.S. Department of Health and Human Services. The NSDUH aims to provide researchers with information about various mental and physical health issues and trends by surveying approximately 70,000 individuals aged 12 and older (NSDUH).

The primary goals of the project include tracking and assessing trends and consequences of substance use and identifying the populations that are most at risk for substance use. Additionally, the NSDUH is conducted in all 50 states as well as the District of Columbia and households are randomly sampled. Trained interviewers are then sent to each of the household addresses to ask general questions. The interviewer will then select one or two of the household residents to complete the full interview and survey. As the NSDUH official website states, it is possible that no resident from the household will be selected to complete the full survey. The NSDUH is voluntary and participants receive $30 in cash at the conclusion of their approximately one-hour interview. Household residents who are selected to complete the full interview do so in their own home. The interviewer brings a laptop to conduct the interview. Participants are allowed to privately answer the majority of the questions on the computer without the interviewer knowing which answers they selected. For some questions, the interviewer reads the questions out loud and then enters the response.

Dependent Variables

The 2017 NSDUH codebook (RTI International, 2018 October 23) provides researchers with recoded variables to measure adult MDEs. The recoded dependent binary variable in the NSDUH for reporting lifetime MDE is AMDELT and is derived from 11 variables, outlined below, that measure various depressive symptoms. I then recoded AMDELT as necessary for multiple logistic regression analyses.

1.ADDPREV is a binary variable that asked participants to reflect on any period of time in their life lasting several days or longer when they felt sad, empty, or depressed.

2. ADDSCEV is a binary variable that asked participants to reflect on any period of time in their life lasting several days or longer most of the day they felt discouraged about how things were going in their life.

3.ADLOSEV is a binary variable that asked participants if they had ever had a period of time lasting several days or longer when they had lost interest in most things they enjoyed such as work, hobbies, and personal relationships.

4. ADDPPROB is a binary variable that asked participants to consider several symptoms of MDE including difficulties with sleep, appetite, energy, concentration, and feelings of low self-worth and whether they had experienced any of these problems at any point of their life with episodes lasting two weeks or longer.

5. ADLSI2WK is a binary variable that asked participants if they had felt discouraged about how things were going in their life, lost interest in most things like work, hobbies, and other things they usually enjoyed for most of the day, nearly every day for the last two weeks.

6. ADDPR2WK is a binary variable that asked participants if they had experienced any period of time in their life where they had negative feelings lasting most of the day, nearly every day for two weeks or longer.

7. ADWRHRS asked participants to think of times lasting two weeks or longer when with their mood(s) were most severe and frequent. Participants were asked to generally reflect on how long those feelings lasted. Response options included severe feelings from less than one hour long, at least 1 hour but no more than 3 hours, at least 3 hours but no more than 5 hours, and 5 or more hours.

8. ADWRDST asked participants to consider the periods of time lasting two weeks or longer when their emotional distress was most severe and frequent and specifically asked how severe their emotional distress was during those times ranging from mild, moderate, severe, and very severe.

9. ADWRCHR asked participants to think of the times lasting two weeks or longer when their mood was the most severe and frequent and specifically asked them how often their emotional distress was so severe that nothing could cheer them up. Responses ranged from often, sometimes, rarely, and never.

10. ADWRIMP asked participants to reflect on periods of time lasting two weeks or longer when their emotional distress was so severe that they could not do daily activities. Responses ranged from often, sometimes, rarely, and never.

11. ADSMMDEA is a binary indicator variable that corresponds to whether the participant met five of the nine criteria for diagnosis of major depression. ADSMMDEA was comprised of nine variables measuring participant reflections on: depressed moods most of the day, markedly diminished interest or pleasure in all or almost all activities most of the day, weight loss or

weight gain, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness, diminished ability to think or concentrate or indecisiveness, and recurrent thoughts of death or recurrent suicide ideation. Respondents were classified as having either 5 or more symptoms or less than 5 symptoms.

The dependent variable for MDE within the past year is AMDEYR and was created from both the variable measuring MDE in an individual's lifetime and a variable that measured respondents who reported a period of depression lasting two weeks or longer in the past 12 months.

Independent and Control Variables

Independent variables for this thesis include various sociodemographic factors as well as an alcohol use factor. The NSDUH codebook also provides researchers with recoded demographic variables which were used for this thesis. I recoded all dichotomous variables in order to conduct logistic regression analyses. For logistic regression analysis, variables were recoded so that response categories could be interpreted in relation to the base reference.

Gender: The binary variable of GENDER was coded so that males are the reference category for analysis.

Age: The variable AGE_RCNEW was coded to 1=18-25, 2=26-34, 3=35-49, 4=50 or older. Because the focus of the analyses was adults 18 and older, the category of 12-17 was dropped. The reference category for the analyses is 18 to 25.

Race: The variable NEWRACE2 was coded as 1=nonHispanic White, 2= nonHispanic Black/African American, 3= nonHispanic Native American/Alaska Native, 4= nonHispanic Native Hawaiian/Pacific Islander, 5= nonHispanic Asian, 6= nonHispanic more than one race, and 7=Hispanic. The reference category for race is non-Hispanic Whites.

Income: The variable INCOME_RC was coded as 1=less than $20,000, 2=$20,000-49,999, 3=$50,000-74,999, 4=$75,000 and over. The reference category for income is less than $20,000.

Work Status: The variable WORKSTAT_RC was coded as 1=Full time, 2=Part time, 3=Unemployed, 4=Other. The reference category for work status is full-time.

Self-Rated Health: The variable HEALTH_RC was reverse coded so that the direction of the variable was from 1=poor/fair health, 2=good health, 3=very good, and 4=excellent health. The reference category for self-rated health is poor or fair health.

Outpatient Mental Health Treatment in the past 12 months: The binary variable AUOPTYR_RC measures whether a respondent sought outpatient mental health treatment in the past 12 months at the time of the interview. The reference category for outpatient mental health treatment is those who sought treatment in the past 12 months.

Alcohol Use, Binge Drinking: The variable ALCBNG30 measured how many days in the past 30 days that an individual had 4 or 5 more drinks per drinking occasion. According to the CDC, binge drinking includes consuming 4 or more alcoholic beverages for women and 5 or more for men in a time span of approximately two hours. The values used in analyses are 1=never used alcohol, 2=0-4 days, 3=5-10 days, 4=11-15 days, 5=16-20 days, 6=21-25 days, 7=26-30 days. This variable was chosen for inclusion in the study because it serves as a proxy for frequent and heavy consumption of alcohol. The reference category for alcohol use is those who have never had alcohol.

Multiple Logistic Regression Models

To assess the relationship between the sociodemographic and alcohol use variables and MDE, two multiple logistic regression models were conducted. The first model examines lifetime MDE and the second model examines MDE in the past 12 months. Because the

estimates that are derived from the 2017 NSDUH are based on random sample survey data from households rather than complete data for the entire population, the data must be weighted in order to "obtain unbiased estimates for survey outcomes in the population" (NSDUH.org). The weight can be interpreted as the total number of individuals in the target population that each record on the file represents. To account for the complex survey design, the analyses were run with the final analytical weighting variable using the following commands in StataSE (15): verep[pweight= analwt_c], strata(vestr). The weighted values then were set for both of the multiple logistic regression models.

The first multiple logistic regression model assesses the relationship between lifetime MDE and sociodemographic and alcohol use variables. The dependent variable is lifetime MDE and the independent variables include binge drinking in the past 30 days, gender, age, and race along with controls for income, educational status, work status, mental health treatment, and self-rated health. Control variables were added in steps in order to examine how the results change when adding in other potentially confounding factors; however, the independent variables of binge drinking, gender, age, and race remained statistically significant in predicting the odds of lifetime MDE with the inclusion of the control variables. Because the independent variables remained statistically significant with the inclusion of the control variables, Table 3 represents the full model with all independent and control variables included.

The second multiple logistic regression model examines the relationship between MDE in the past 12 months (past year MDE) and sociodemographic and alcohol use variables. The dependent variable is past year MDE. As with the first model measuring lifetime MDE discussed in the previous paragraph, the same variables and stepwise processes for analysis were used for measuring past year MDE. Similar to the first model, the independent variables of binge

drinking, gender, and race also remained statistically significant in predicting the odds of past year MDE while including the control variables. Because the independent variables remained statistically significant with the inclusion of the control variables, Table 4 represents the full model with all independent and control variables included. For the multiple logistic regression models, results are reported in odds ratios. Referent groups for both analyses were strategically chosen to better understand differences between various demographic characteristics.

RESULTS

Descriptive Statistics

Descriptive statistics for study variables can be found in Table 1 **<see Table 1>**. The total number of individuals included in the sample was 42,554. A brief analysis of descriptive statistics reveals differences in the demographic make-up of the survey sample. To highlight demographic differences, there are more females than males and a majority percentage of respondents (60%) identified as non-Hispanic Whites. After removing individuals less than 17 years old from the data for the purpose of the study, about 58% of respondents were in the age categories of 18 to 25 and 35 and 49. About 60% of the sample population had an income between the ranges of $20,000 to $49,999 and more than $75,000. More than 50% of the sample were employed full time and most individuals self-reported having very good or excellent health. Approximately 90% of the sample had not sought mental health outpatient treatment. Sixteen percent of the total sample were coded as having a MDE in their lifetime, and nine percent were coded as having a past year MDE.

Preliminary Analysis

Model fit analyses using Bayesian information criterion (BIC) comparison values for both lifetime MDE and past year MDE reveal that the full models including all independent and

control variables are best suited for the data. BIC values criteria for model selection among a set of models states that the model with the lowest BIC is preferred. In assessing stepwise model fit, the calculated BIC value provides very strong support for the full model for both dependent variables. Additionally, to test for multicollinearity, the *collin* command using STATA 15.1 was run for the independent and control variables. The variance inflation factor (VIF) command has been generalized to be of use for models in which there is a binary dependent variable. VIF can be used to assess how much the variance of an estimated regression coefficient increases if predictors are correlated. Statistical literature suggests that VIF values exceeding 10.0 indicate high levels of multicollinearity, indicating that lower VIF scores are desired for more accurate analyses. Results from the VIF analyses demonstrates that there is little multicollinearity among the independent and control variables being used in the study. Results from the multicollinearity tests for both lifetime and past year MDE variables can be found in Table 2 **< see Table 2>.**

Multiple Logistic Regressions

Model 1

Model 1 **<see Table 3>** examined the relationship between lifetime MDE and sociodemographic and alcohol use variables with N= 29,271 (F=94.27 p<.001). This subsample is considerably smaller than all respondents who participated in the NSDUH survey because the analyses take into account only individuals 18 or older for all survey questions. With regard to gender, the odds of females reporting lifetime MDE increased by a factor of 1.766 (p<.001) as compared to males. The model also indicates that an increased number of days in which the respondent consumed 4 to 5 or more alcohol beverages within the past 30 days is associated with higher odds of reporting MDE within one's lifetime. The reference group in which comparisons are being made are individuals who *have never had alcohol*. All categories of the alcohol binge

drinking variable were statistically significant (p<.001). Specifically, the odds of reporting lifetime MDE when consuming 4 to 5 or more alcoholic beverages increased by factors of 2.456 for 0-4 days of the month, 2.629 for 5-10 days of the month, 3.552 for 11-15 days of the month, 4.322 for 11-16 days of the month, 3.590 for 21-25 days of the month, and 4.036 for 26-30 days of the month. To better visualize the effects of gender and alcohol use on reporting of lifetime MDE, **Figure 1** represents the predicted probabilities of reporting lifetime MDE as varied by gender and alcohol use. For example, when looking at 16 to 20 days of the month in which an individual consumes 4/5 or more alcoholic beverages, the predicted probability of females reporting lifetime MDE is approximately .28 or 28% while the predicted probabilities for males reporting lifetime MDE is approximately .18 or 18%. As seen in the figure, women are more likely than men at every category of alcohol use to have higher probabilities of reporting MDE.

There are also several statistically significant findings in the reporting of lifetime MDE with regard to racial and ethnic differences. The reference group for race and ethnicity is non-Hispanic Whites. This group was selected as the reference group because it has the largest number of individuals, and I was interested in how ethnic and racial minorities compare to non-Hispanic Whites. For non-Hispanic Blacks/African-Americans, the odds of reporting lifetime MDE decreased by a factor of .567 (p<.001). For non-Hispanic Asians, the odds of reporting lifetime MDE decreased by factor of .754 (p<.005). For Hispanic individuals, the odds of reporting lifetime MDE decreased by a factor of .728 (p<.01).

Age is also associated with differences in reported odds of lifetime MDE. The reference category for age is individuals aged 18 to 25. All categories of age were statistically significant (p<.001). Specifically, the odds of reporting lifetime MDE decreased by factors of .773 for individuals aged 26-34, .612 for individuals 35-49, and .419 for individuals 50 and older. To

better visualize the effects of age and gender on lifetime MDE, **Figure 2** represents the predicted probabilities of reporting lifetime MDE. As seen in Figure 2, despite the downward trend, women at all ages are more likely to have higher predicted probabilities of reporting lifetime MDE as compared to men. For example, at ages 26 to 34, the predicted probability of females reporting lifetime MDE is approximately .20 or 20% compared to the predicted probability of .13 or 13% for males aged 26 to 34 reporting lifetime MDE. In order to better visualize the relationship between age, alcohol use, and MDE, **Figure 3** represents the predicted probabilities of reporting lifetime MDE. Figure 3 shows that individuals 18 to 25 have higher predicted probabilities of reporting lifetime MDE as compared to other age categories, and that this trend holds true across the various alcohol use categories. For example, the predicted probability of an individual between 18 and 25 years old who drinks 4 or more alcoholic beverages 16-20 days of the month reporting lifetime MDE is approximately .31 or 31%. For individuals aged 50 or older who likewise drink 4 or more alcoholic beverages 16-20 days of the month, the predicted probability of a reported lifetime MDE is approximately .17 or 17%.

Income was not statistically significant at any level. For individuals who reported working part time as compared to full time, the odds of reporting lifetime MDE increased by a factor of 1.188 or ($p<.05$).

Having sought outpatient mental health treatment in the past 12 months was associated with increased odds of reporting lifetime MDE. Specifically, for individuals who reported that they had received outpatient mental health treatment in the past 12 months, the odds of reporting lifetime MDE versus individuals who had not sought mental health treatment increased by a factor of 7.026 ($p<.001$). Self-rated health among all categories was also associated with decreased odds of reporting lifetime MDE with each category being significant ($p<.001$). The

reference group for self-rated health was individuals who reported fair or poor health. The odds of reporting lifetime MDE decreased by factors of .451 for individuals who rated their health as good, .689 for individuals who rated their health as very good, and .563 for individuals who rated their health as excellent.

Model 2

Model 2 <**see Table 4>** examined the relationship between past year MDE and sociodemographic and alcohol use variables with N= 29,240 (F=124.04 p<.001). The results show a gender difference, specifically that being female increased the odds of reporting past year MDE by a factor of 1.55 as compared to males. Results also indicate that an increased number of days in which the respondent consumed 4 to 5 or more alcohol beverages within the past 30 days is associated with higher odds of reported past year MDE. The reference group was individuals who *have never had alcohol.* All categories of the alcohol binge drinking variable were statistically significant (p<.001). Specifically, the odds of reporting past year MDE increased by factors of 2.031 for 0-4 days of the month, 2.273 for 5-10 days of the month, 4.021 for 11-15 days of the month, 4.128 for 16-20 days of the month, 4.816 for 21-25 days of the month, and 3.628 for 26-30 days of the month. **Figure 4** presents a visualization of the predicted probabilities that are affected by gender and alcohol use. For example, the predicted probability of females who drink 4 or more alcoholic beverages 21 to 25 days of the month reporting past year MDE is approximately .17 or 17%. In comparison, the predicted probability of males who drink 4 or more alcoholic beverages 21 to 25 days of the month reporting past year MDE is approximately .11or 11%. While women do have higher predicted probabilities of reporting past year MDE across all categories of alcohol use, probabilities for both males and females decrease between 26 and 30 days, a trend that warrants further examination.

With regard to racial and ethnic differences in reporting of MDE in the past 12 months, there are several significant findings. The reference group for race and ethnicity is non-Hispanic Whites. The odds of non-Hispanic Blacks/African-Americans reporting past year MDE decreased by a factor of .685 ($p<.001$). The odds of non-Hispanic Asians reporting past year MDE decreased by factor of .636 ($<.05$), and the odds of Hispanic individuals reporting past year MDE decreased by a factor of .737 ($p<.05$).

Age has an association with differences in reported odds of past year MDE. The reference category for age is individuals aged 18 to 25. All categories of age were statistically significant ($p<.001$). Specifically, the odds of reporting past year MDE decreased by factors of .610 for individuals 26 to 34, .417 for individuals aged 35-49, and .227 for individuals aged 50 and older. **Figure 5** represents the predicted probabilities of reporting past year MDE by age and gender. As seen in Figure 5, both men and women decrease in probabilities of reporting past year MDE as they get older, however, women continue to have higher probabilities as compared to men in all age categories. For example, the predicted probability of reporting past year MDE for females aged 26 to 34 is approximately .12 or 12% whereas the predicted probability of reporting past year MDE for males aged 26 to 34 is approximately .06 or 6%. **Figure 6** represents the predicted probabilities of reporting past year MDE as affected by age and alcohol use. As seen in Figure 6, individuals aged 18 to 25 have higher predicted probabilities of reporting past year MDE at all categories of alcohol use. For example, the predicted probability of reporting past year MDE for individuals aged 18 to 25 who drink 4/5 or more alcoholic beverages 11 to 15 days of the month is approximately .22 or 22% whereas the predicted probability of reporting past year MDE for individuals aged 50 or older who drink 4/5 or more alcoholic beverages 11 to 15 days of the month is approximately .04 or 4%.

Higher income is associated with decreased odds of reported past year MDE. Income is statistically significant for individuals with incomes of $50,000 or more. The reference group for income is individuals with less than $20,000. Specifically, the odds of reporting past year MDE decreased by a factor of .703 ($p<.05$) for individuals with an income of $50,000 to $74,999 and decreased by a factor of .690 ($p<.01$) for individuals with an income of $75,000 or more. **Figure 7** represents the predicted probabilities of reporting past year MDE as influenced by income and alcohol use. As seen in the figure, individuals with an income of less than $20,000 have higher predicted probabilities of reporting past year MDE compared to individuals who earn $75,000 or more in all categories of alcohol use. For example, the predicted probability of reporting past year MDE for an individual whose income is between $20,000 and $49,999 and drinks 4/5 or more alcoholic beverages 16 to 20 days of the month is approximately .14 or 14%. In comparison, the predicted probability of reporting past year MDE for an individual whose income is $75,000 or more and drinks 4/5 or more alcoholic beverages 16 to 20 days of the month is approximately .10 or 10%.

Work status is statistically significant for all categories ($p<.05$) with working full time as the reference group. The odds of reporting past year MDE increased by factors of 1.216 for individuals working part time, 1.37 for individuals who are currently unemployed, and 1.16 for individuals who are categorized as having another form of employment. Having sought outpatient mental health treatment in the past 12 months was associated with increased odds of reporting past year MDE. Specifically, individuals who reported that they had received outpatient mental health treatment in the past 12 months had 8.713 times higher odds of reporting past year MDE ($p<.001$) versus individuals who had not sought mental health treatment. Self-rated health was also associated with decreased odds of reporting past year MDE

with all categories being statistically significant ($p<.001$). The reference group for self-rated health was individuals who reported fair/poor health. The odds of reporting past year MDE decreased by factors of .262 for individuals who rated their health as good, .612 for individuals who rated their health as very good, and .360 for individuals who rated their health as excellent.

DISCUSSION

Findings from this study present results that are similar to those found in other studies. This study demonstrates gender differences in rates of reporting both lifetime and past year MDE. Specifically, in this study, women were more likely to report having an MDE in their lifetime, a result that is similar to findings discussed by Hasin, Roodwin, Stinson, & Grant (2005) who looked at more than 43,000 adults (18 years or older) from the National Epidemiological Survey on Alcoholism and Related Conditions in the United States to examine demographic factors related to diagnoses of major depression. Results from this study that show women have higher odds of reporting lifetime and past year MDE agree with other research that examine biological, psychological, and psychiatric gender differences in the prevalence and severity of major depression (Noble, 2005; Kessler, 2003; Albert, 2015).

With regard to the influence of alcohol use, results demonstrate that frequent heavy alcohol use in a span of 30 days (having 4/5 or more alcoholic beverages per drinking occasion) contributed to higher odds of reporting both lifetime MDE and past year MDE. This finding agrees with previous research by Fergusson, Boden, and Horwood (2009), who examined the relationship between alcohol abuse or dependence (AAD) and MD by using fixed-effects modeling to discern causality. By looking at data from the Christchurch Health and Development Study on 625 boys and 630 girls, they found that the association between AAD and MD was best explained by a causal model in which alcohol problems led to an increased risk of MD, rather

than MD leading to an increased risk of AAD (self-medication model). The findings from this study agrees with previous research that demonstrates causal links between alcohol use and symptoms of depression, specifically that patterned heavy alcohol consumption may act as a biological and social stressor that aids in the etiology of depression (Schuckit & Hesselbrock, 1994; Swednsen & Merikangas, 2000).

Being older was also found to be associated with decreased odds of reporting both lifetime and past year MDE as compared to individuals 18 to 25. In considering the transitional life period of 18 to 25 year olds, it is of importance to further examine the mechanisms through which depressive symptoms emerge. The findings in this study agree with past research that provides evidence for increased depression among young adults (Friis, Ulrich, Wittchen, Pfister, & Lieb, 2002). Of note, however, is that increased depression among young adults may be attributed to factors outside the scope of this study including the frequency and activity related to social media use, an area of research that has widely expanded. Interestingly, income was only significant in the measure of past year MDE, with individuals with incomes of $50,000 and higher having decreased odds of reporting MDE. Being unemployed, working part time, and having an employee status that was categorized as other (such as being a fulltime homemaker or disabled) reveals a general trend toward having reported either lifetime or past year MDE. This finding agrees with previous research that demonstrates disparities in mental health, particularly depressive episodes, that are stratified by socioeconomic status (Zimmerman & Katon, 2005; Miech & Shanahan, 2000). These findings are important because they reveal significant differences in sociodemographic factors contributing to lifetime and past year MDE.

Although a biological framework can help us to understand the ways in which AUD and MD create physiological differences that affect our everyday well-being and health, the

disparities that continue to exist in rates of both AUD and MD for women, people of color, and low socio-economic status individuals point to a need to reconsider the effectiveness of current treatment and intervention programs. Additionally, researchers working in academic settings and individuals working in community agencies must collectively work together in order to effectively address various health disparities. For example, Betancourt (2006) argues that patient care, with consideration to the role of academic medicine, can be considerably improved by education by converging both academic research findings and health professions training. Furthermore, Betancourt notes that academic research can help improve health outcomes by better identifying and addressing sources of disparities and potentially offer more helpful intervention strategies. I argue that a holistic intervention that addresses the biological and physiological consequences of MD and AUD as well as the social factors that contribute to patterns of health behavior will prove important in creating effective and affordable treatment programs.

LIMITATIONS AND FUTURE DIRECTIONS

Although this study allowed me to examine basic associations between the predictor variables and both lifetime and past year MDE, the creation of interaction variables would have been a useful tool for examining the joint effects of variables such as income and outpatient mental healthcare or interactional effects of race and gender, however, this was beyond the scope of the project. Future studies could explore in greater depth how interacting sociodemographic variables influence depression outcomes. Although the alcohol variable provided through the NSDUH codebook is a good proxy measure for binge drinking, future research could involve the construction of a more conceptually thorough binge drinking variable that measured more complex dimensions related to heavy alcohol use. While this study allowed me to examine the

general associations between alcohol use, demographics, and MDE, the nature of this data is cross sectional, which prevented me from making claims of causality. There is, however, an interesting longitudinal issue that is highlighted through questionable effects of age on reporting lifetime MDE that should be examined further. That is, there is a bidirectional potential that exists in this data. The predictor variables could be causing greater reports of MDE, however, MDE could be contributing in large part to differences that we see in demographics and alcohol use. Specifically, studies show that heavy alcohol use can contribute to the risk of MDE but MDE can, in turn, impact frequency of heavy alcohol use. Future research could further explore causal mechanisms through more advanced statistical techniques.

CONCLUSION

This study reveals significant differences in lifetime and past year MDE that are predicted by sociodemographic and alcohol use variables. These differences point to a need for both researchers and community agencies to consider the barriers that prevent individuals from seeking intervention and treatment programs for both AUD and MD. Despite the fact that social science researchers have long examined contributing factors to both AUD and MD, gaps still exist that create health and wealth disparities among the U.S population. Community agencies that seek to provide treatment and care to a wider clientele should partner with academic researchers who specifically study both psychological, sociological, and biological mechanisms that lead to differences in rates of AUD and MD. An interdisciplinary approach allows community agencies to offer more individualized treatment and recovery programs that fully consider the various contexts in which an individual navigates their social and personal life. By taking into consideration the research that biopsychosocial models of AUD and MD have to offer, programs can be developed that enable greater access for a wider demographic population,

and potentially lead to a decrease of racial, gender, and economic gaps with regard to mental health care and addiction treatment.

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Table 1. Descriptive Statistics of Study Variables (N=42,554)

Measures	Obs	%
Gender		
Male	19,987	46.97
Female	22,567	53.03
Race/Ethnicity		
NonHisp White	25870	60.79
NonHisp Black/Af. Am	5230	12.29
NonHisp Native Am/AK Native	640	1.50
NonHisp Native HI/Other Pac Isl	195	0.46
NonHisp Asian	2070	4.86
NonHisp more than one race	1381	3.25
Hispanic	7168	16.84
Income		
Less than $20,000	8,370	19.67
$20,000-$49,999	13,321	31.30
$50,000-$74,999	6,704	15.75
$75,000+	14,159	33.27
Age		
18-25	13,840	32.52
26-34	8,786	20.65
35-49	11,214	26.35
50 and older	8,714	20.48
Work Status		
Fulltime	22,354	52.53
Parttime	6,612	15.54
Unemployed	2,560	6.02
Other	11,028	25.92
Self-Rated Health		
Missing	13	0.03
Poor/Fair	4,829	11.35
Good	9,761	22.94
Very good	11,800	27.73
Excellent	16,151	37.95
Outpatient Mental Health Treatment		
Missing	218	0.51
Yes	3,656	8.59
No	38,680	90.90
# of days drinking 4-5 drinks/30 days		
Missing	12,944	30.42
Never used alcohol	5,935	13.95
0-4	20,310	47.73
5-10	2,385	5.60
11-15	423	0.99
16-20	254	0.60
21-25	116	0.27
26-30	187	0.44

Table 2. VIF tests for multicollinearity

Variable	AMDELT VIF value	AMDEYR_RC VIF value
ALCBNG30_RC	1.05	1.05
GENDER	1.03	1.03
NEWRACE2	1.05	1.05
AGE_RCNEW	1.08	1.08
INCOME_RC	1.17	1.17
WRKSTAT_RC	1.14	1.14
AUOPTYR_RC	1.02	1.02
HEALTH_RC	1.03	1.03

Table 3. Multiple logistic regression (Odds Ratios) examining factors influencing reporting of lifetime occurrence of MDE (N=29,271; F=94.27, p<.001)

Lifetime MDE	Odds Ratio	Std. Error (t value)	95% CI
# of days drinking 4-5 drinks/30 days			
0-4	2.457 ***	.183 (12.03)	2.115-2.856
5-10	2.629 ***	.295 (8.61)	2.098-3.294
11-15	3.552 ***	.732 (6.15)	2.347-5.375
16-20	4.322 ***	1.247 (5.07)	2.421-7.717
21-25	3.590 ***	1.156 (3.97)	1.879-6.857
26-30	4.036 ***	1.011 (5.57)	2.440-6.676
Gender			
Female	1.766***	0.90 (11.05)	1.592-1.958
Race/Ethnicity			
NonHisp Black/Af. Am	.567***	.049 (-6.53)	.476-.675
NonHisp Native Am/AK Native	.711	.170 (-1.42)	.439-1.150
NonHisp Native HI/Other Pac Isl	1.107	.429 (.26)	.508-2.411
NonHisp Asian	.754**	.090 (-3.05)	.495-.865
NonHisp more than one race	1.042	.147 (.29)	.783-1.385
Hispanic	.728 ***	.065 (-3.53)	.608-.872
Age			
26-34	.773***	.046 (-4.27)	.685-.872
35-49	.612***	.033 (-9.01)	.548-.683
50 and older	.419***	.033 (-10.85)	.356-.492
Income			
$20,000-$49,999	1.025	.077 (.33)	.880-1.194
$50,000-$74,999	.888	.090 (-1.16)	.724-1.089
$75,000+	.890	.068 (-1.50)	.762-1.040
Work Status			
Parttime	1.188 *	.096 (2.12)	1.008-1.399
Unemployed	1.079	.125 (.66)	.854-1.364
Other	.928	.043 (-1.57)	.845-1.021
Outpatient Mental Health Treatment			
Yes	7.0236 ***	.539 (25.40)	6.022-8.197)
Self-Rated Health			
Good	.451***	.034 (-10.42)	.386-.525
Very good	.689***	.054 (-4.71)	.587-.807
Excellent	.563***	.035 (-9.00)	.495-.640
__cons	.132***	.017 (-14.92)	.100-.173

Notes: p-value indicators: * $p \leq 0.05$, **$p \leq 0.01$, *** $p \leq 0.001$

Table 4. Multiple logistic regression (Odds Ratios) examining factors influencing reporting of MDE in the past year (N=29,240; F=124.04, p<.001)

MDE in past year	Odds Ratio	Std. Error (t value)	95% CI
# of days drinking 4-5 drinks/30 days			
0-4	2.031***	.194 (7.42)	1.676-2.461
5-10	2.273 ***	.308 (6.05)	1.731-2.985
11-15	4.021 ***	1.04 (5.37)	2.388-6.770
16-20	4.128 **	1.617 (3.62)	1.880-9.067
21-25	4.816 ***	1.834 (4.13)	2.241-10.350
26-30	3.628 **	1.263 (3.67)	1.792-7.344
Gender			
Female	1.557***	.095 (7.25)	1.377-1.760
Race/Ethnicity			
NonHisp Black/Af. Am	.685***	.066 (--3.90)	.564-.832
NonHisp Native Am/AK Native	.734	.206 (-1.10)	.417-1.290
NonHisp Native HI/Other Pac Isl	.705	.342 (-.72)	.265-1.870
NonHisp Asian	.636**	.098 (-2.91)	.466-.869
NonHisp more than one race	1.31	.224 (1.61)	.934-1.854
Hispanic	.732**	.081 (-2.79)	.586-.916
Age			
26-34	.610***	.051 (-5.88)	.515-.722
35-49	.417***	.032 (-11.27)	.375-.487
50 and older	.227***	.020(-16.08)	.188-.273
Income			
$20,000-$49,999	.859	.079 (-1.64)	.714-1.034
$50,000-$74,999	.703**	.086(-2.87)	.550-.899
$75,000+	.690**	.077 (-3.31)	.551-.864
Work Status			
Parttime	1.216*	.111(2.14)	1.01-1.462
Unemployed	1.379*	.180 (2.46)	1.061-1.794
Other	1.161	.84 (2.07)	1.004-1.344
Outpatient Mental Health Treatment			
Yes	8.713***	.687 (27.45)	7.436-10.209
Self-Rated Health			
Good	.262 ***	.029 (-11.87)	.208-.328
Very good	.612***	.056 (-5.27)	.508-.738
Excellent	.360***	.029 (-12.49)	.306-.425
_cons	.132***	0.197 (-13.57)	.098-.178

Notes: p-value indicators: * $p \leq 0.05$, **$p \leq 0.01$, *** $p \leq 0.001$

Figure 1. Predicted probabilities of reporting lifetime MDE by gender and alcohol consumption.

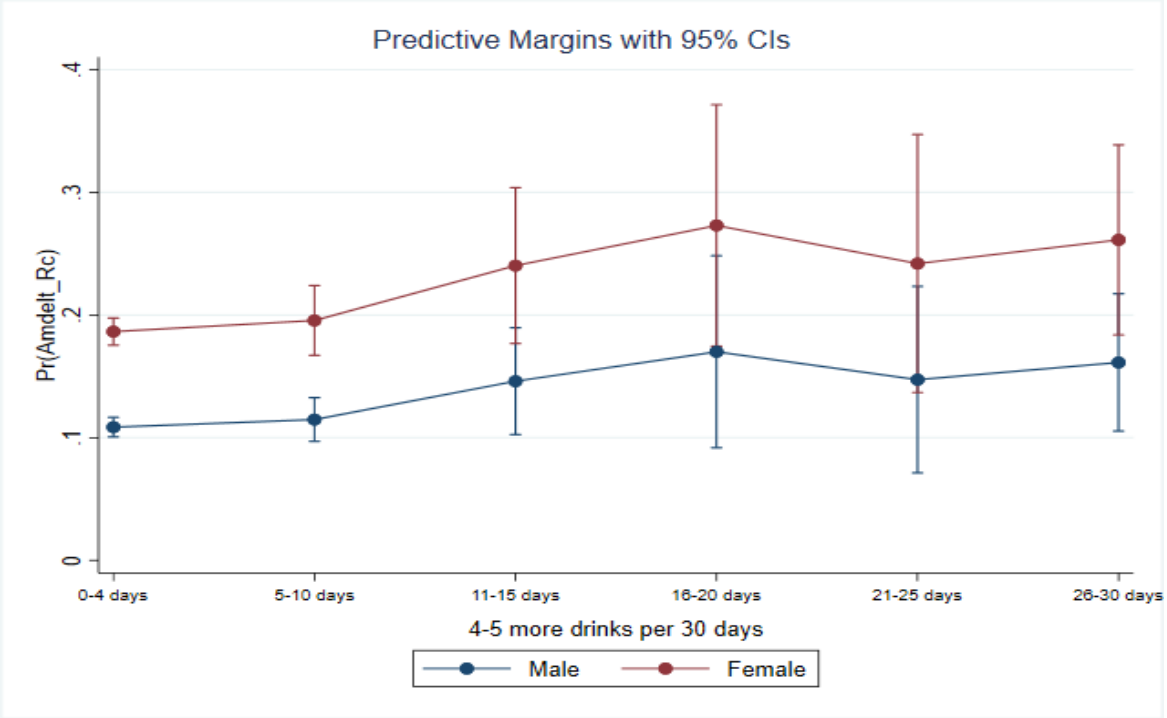

Figure 2. Predicted probabilities of reporting lifetime MDE by age and gender.

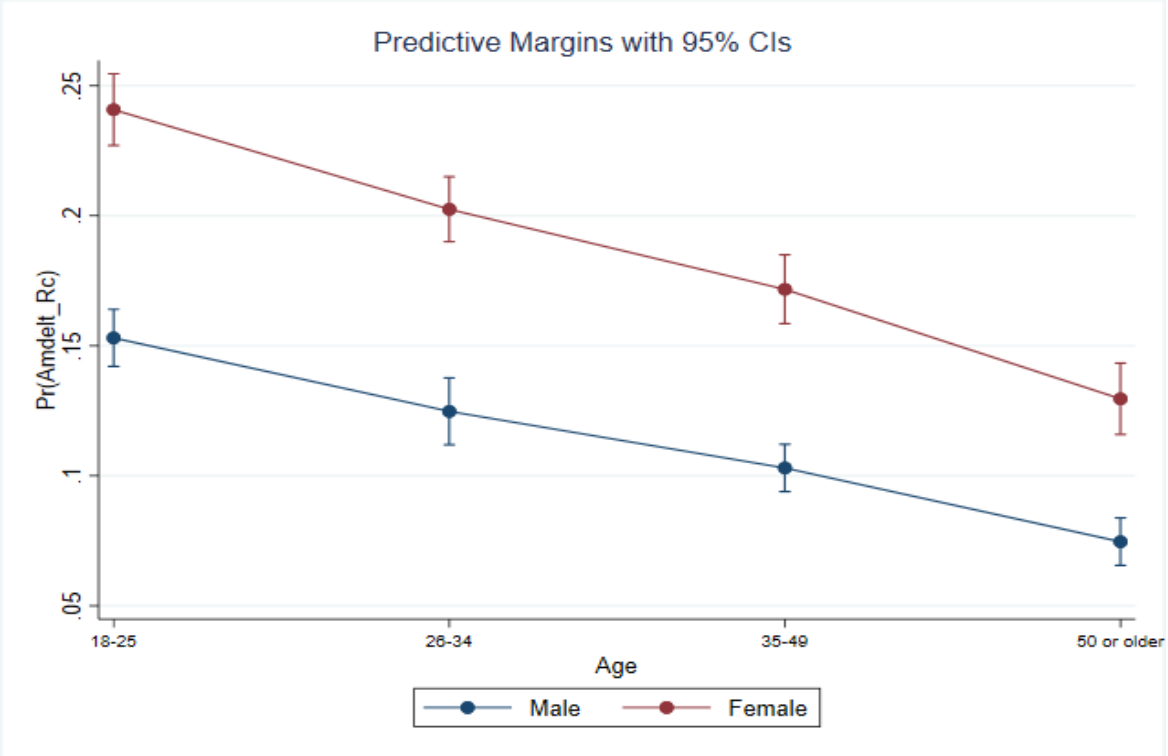

Figure 3. Predicted probabilities of reporting lifetime MDE by age and alcohol consumption.

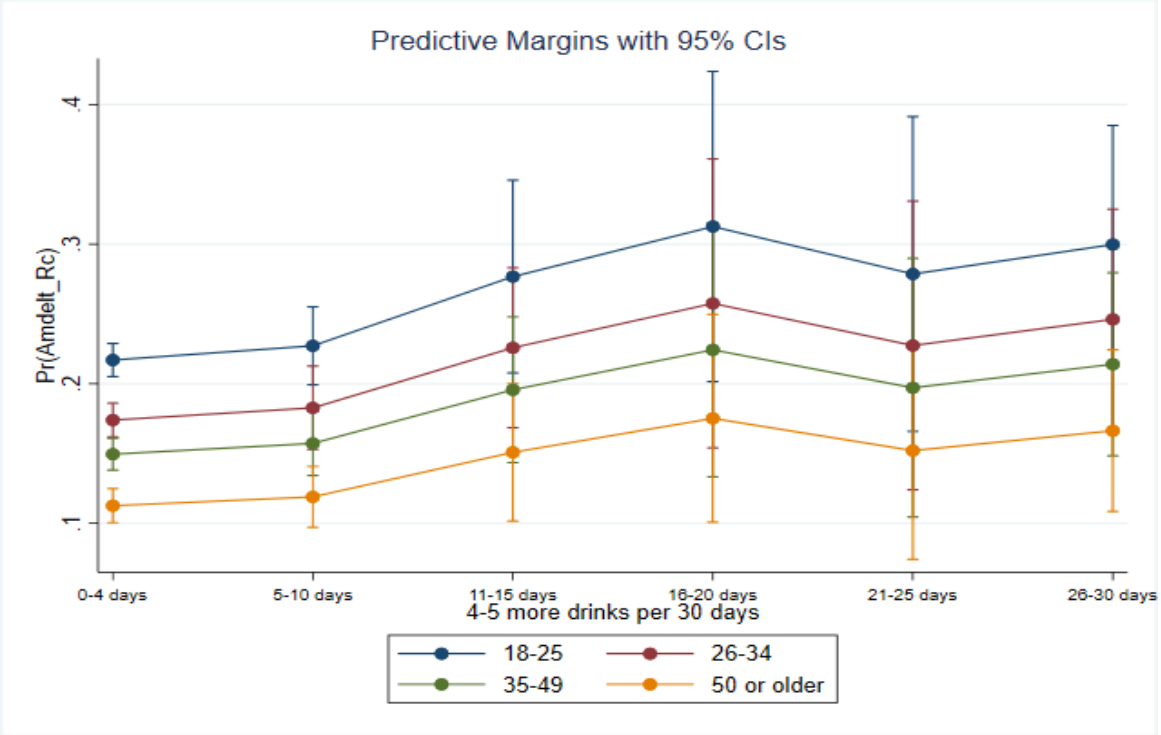

Figure 4. Predicted probabilities of past year MDE by gender and alcohol consumption.

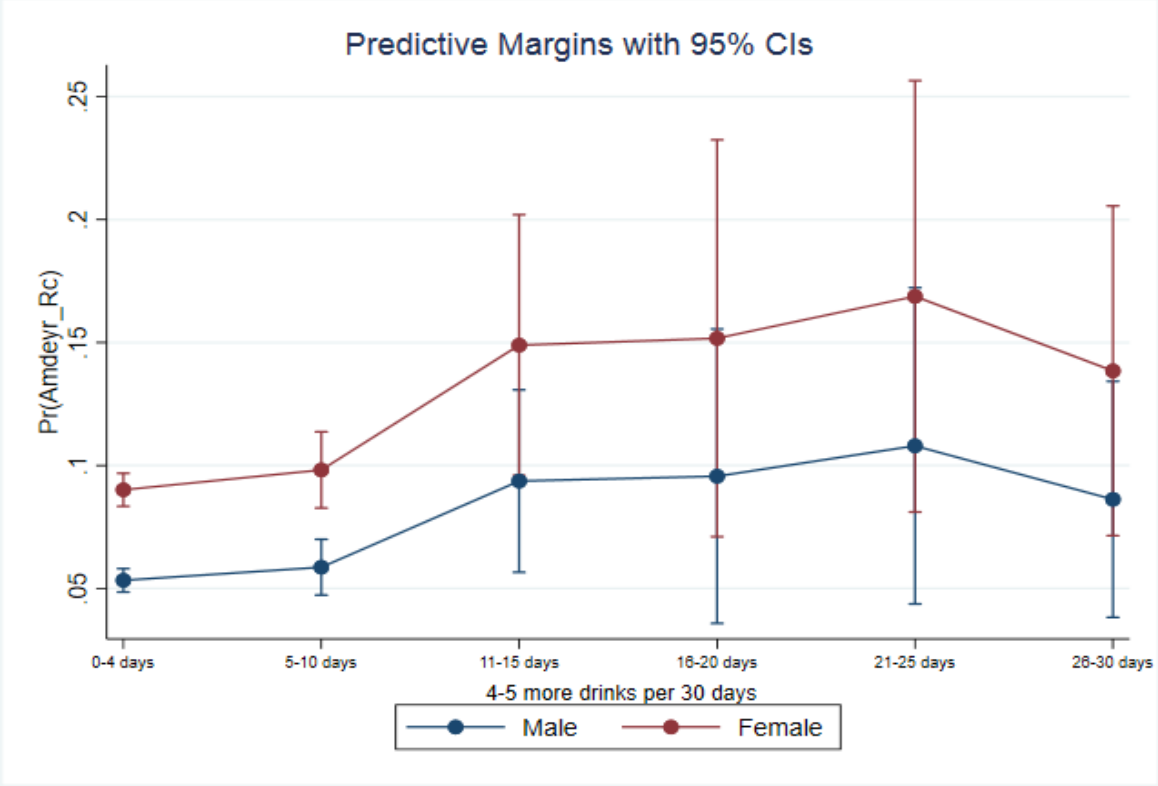

Figure 5. Predicted probabilities of reporting past year MDE by gender and age.

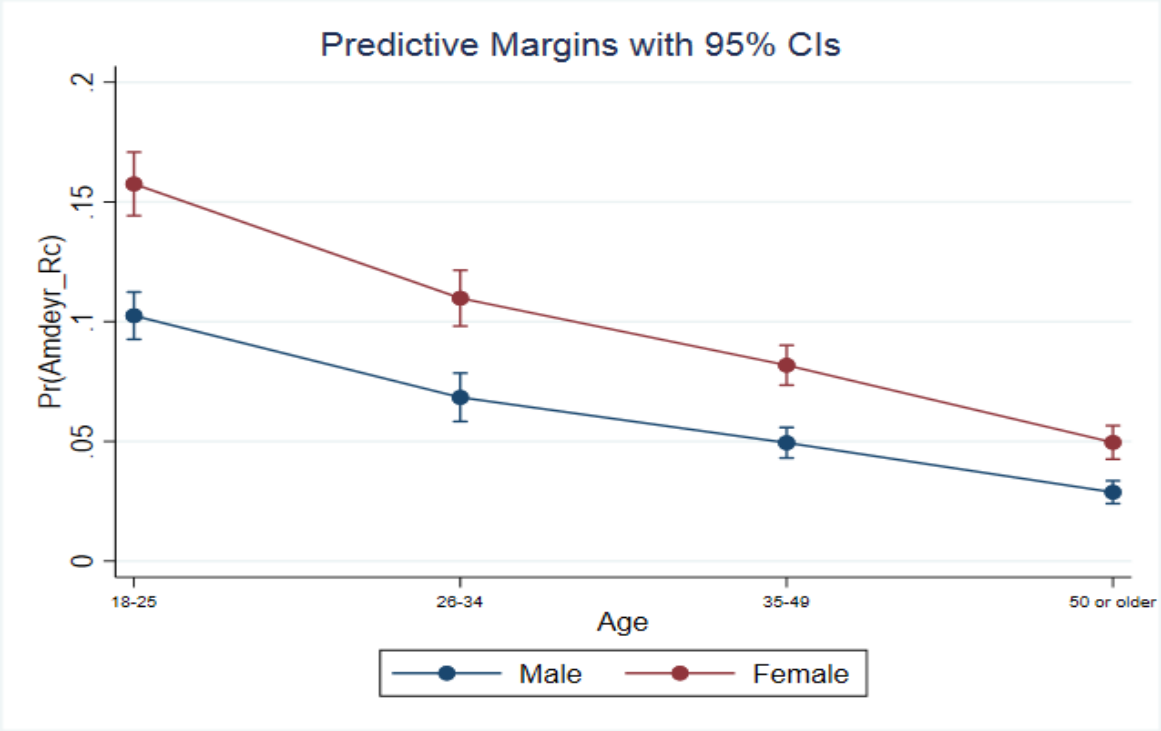

Figure 6. Predicted probabilities of reporting past year MDE by age and alcohol consumption.

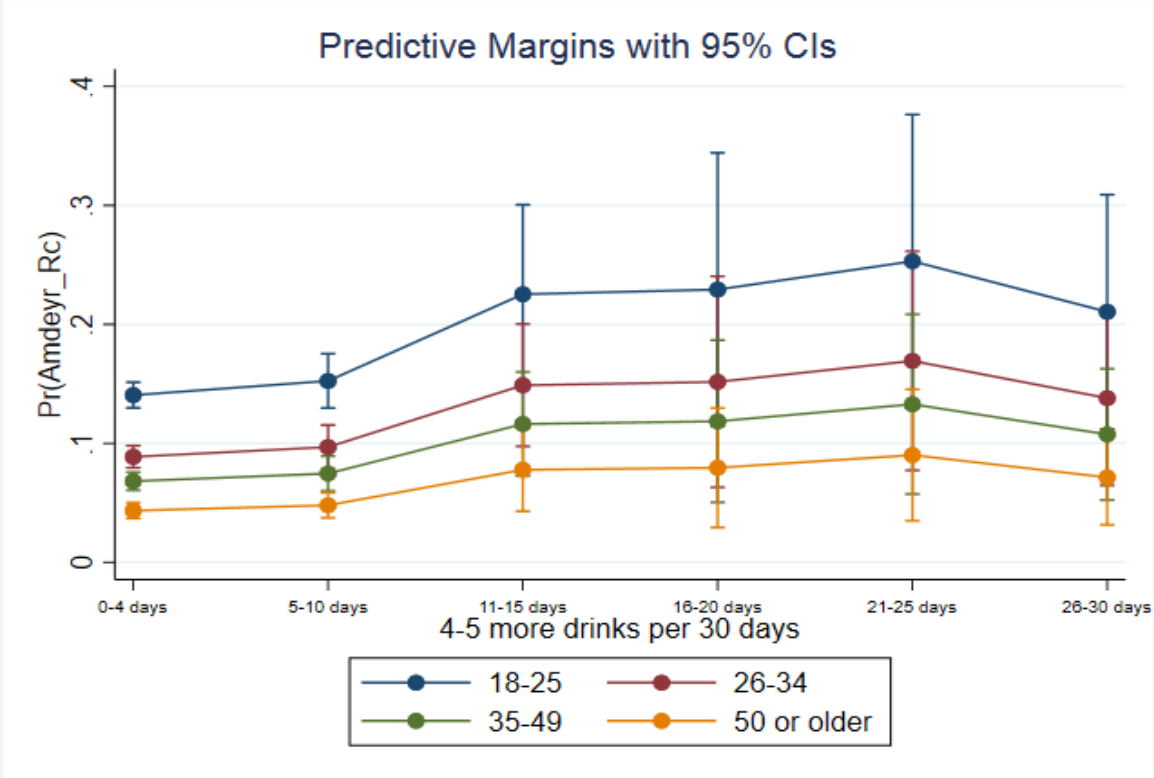

Figure 7. Predicted probabilities of reporting past year MDE by income and alcohol consumption.