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## Comorbid Alcohol-related Problems and Suicidality Disproportionately Impact Men and Emerging Adults among Individuals with Depressive Symptoms

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### Abstract

**Objective:** Depressive disorders are common among adults with alcohol use disorder and with suicidality; however, demographic differences in comorbid alcohol use disorder, binge drinking, and suicidality are understudied. The objective of this study was to determine the extent to which comorbid suicidality and alcohol use disorders and comorbid suicidality and binge drinking differ by age and gender among adults with depressive symptoms.

**Method:** The sample included adults (unweighted  $N=29,460$ ) in the United States who completed the 2015–2018 National Survey of Drug Use and Health and screened positively for depression. Gender and age groups odds of alcohol use disorder only, suicidality only, and alcohol use disorder+suicidality were compared to neither problem. Similar analyses were conducted for binge drinking.

**Results:** Men showed disproportional odds of alcohol use disorder only, all suicidality and alcohol use disorder comorbidities, and binge drinking+active suicidal ideation than women. Emerging adults showed higher odds of: passive and active suicidal ideation only and suicidality+alcohol use disorder than adults 35 and older; binge drinking only, binge drinking+passive suicidal ideation, and binge drinking+active suicidal ideation than all older adults; binge drinking+suicide planning and binge drinking+attempts than adults 50 and older.

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#### Author Contributions

Dr. Lourah Kelly led the manuscript preparation, including the background research, data analysis, and conceptualization of the paper. Dr. Richard Liu led data analytic planning and assisted with data interpretation and background research. Dr. Kristyn Zajac oversaw the paper conceptualization and data analysis. All authors wrote sections, revised multiple drafts, and approved the final version of the manuscript prior to publication.

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#### Declaration of Competing Interests

The authors do not have any conflicts of interests to report.

**Limitations:** Because participants all reported depression symptoms either at the subclinical or clinical level, demographic differences in suicidality, alcohol use disorder, and binge drinking found in this study cannot be generalized to non-depressed samples.

**Conclusions:** Treatment providers should be aware of disproportionately higher odds of comorbid suicidality and alcohol use disorder, and suicidality and binge drinking among men and emerging adults.

### Keywords

alcohol use disorders; binge drinking; suicidality; gender; emerging adults; depressive symptoms

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In the US, over one in ten (13.9%) adults meet criteria for alcohol use disorder annually and almost a third (29.1%) meets criteria in their lifetime (Grant et al., 2015). Alcohol use costs roughly \$250 billion annually in loss of life, lost work, medical care, and criminal justice, among other costs, with binge drinking accounting for 70% of costs; government funding covered about 40% of costs, with the remainder borne by persons who misuse alcohol, families, and society (Sacks et al., 2015). Suicidality (e.g., suicidal ideation and attempts) is highly comorbid with alcohol use disorder; adults with alcohol use disorder show 86% greater odds of suicidal ideation and approximately 3 times greater odds of suicide attempt (Darvishi et al., 2015). Understanding demographic differences in alcohol use disorder and binge drinking in representative samples and identifying key vulnerable groups, such as those with comorbid suicidality, can inform broad prevention and intervention efforts.

Depressive symptoms are correlates of both alcohol use disorder and suicidality. Adults with alcohol use disorder report elevated rates of past year major depressive disorder (16.6%) compared to the general population without alcohol use disorder (9.5%; Chen et al., 2016). Among adults with depressive disorders, depressive symptom severity and co-occurring alcohol or drug use disorder are related to suicide death (Hawton et al., 2013). Although comparatively little work has examined comorbidities of these problems, comorbid alcohol use disorder and depression increase risk of active suicidal ideation (Cohen et al., 2017). Alcohol intoxication is also related to greater suicide attempt lethality among those with alcohol use disorder and mood disorders (Sher et al., 2009).

Studies of suicidality risk factors often use clinical samples; however, suicidality is common in the general population, even in the absence of mental health diagnoses. For example, over half of people who die by suicide have no diagnosed mental health disorder as measured by psychological autopsy (Stone et al., 2018). Core depressive symptoms (i.e., depressed mood, anhedonia) are independently associated with suicidality. Specifically, depressed mood is proximally related to suicidal ideation among persons with depression (Ben-Zeev et al., 2012). Anhedonia is associated with suicidal ideation, even when controlling for other depressive symptoms (Ducasse et al., 2018). The current study investigates suicidality correlates among persons with any depressive symptoms, as subthreshold symptoms increase risk for suicidality.

Among those with depressive symptoms, men and emerging adults (i.e., ages 18–25) are two groups who may have higher rates of binge drinking, alcohol use disorder, suicidality,

and their comorbidities. Gender differences in binge drinking and alcohol use disorder have been narrowing since the 1950s, with women's rates increasing more rapidly than men's (Dawson et al., 2015; Keyes et al., 2008). Data from the National Survey of Drug Use and Health (NSDUH) show adolescent girls were more likely than boys to initiate drinking every year from 2002–2013; however, males were more likely to continue drinking into their 20s (Cheng et al., 2016). Despite earlier initiation, females are not more likely to develop alcohol use disorder; instead males show a shorter time to alcohol use disorder after drinking initiation (Keyes et al., 2010). In population-based surveys, men continue to report higher rates of binge drinking than women (Wilsnack et al., 2018). Despite the narrowing gender gap in binge drinking and alcohol use disorder, men may still have greater risk for negative alcohol sequelae than women.

Gender differences in suicidality depend on suicidality severity, with more men dying by suicide and more women reporting suicidal ideation and attempts (Nock, Borges, Bromet, Cha, et al., 2008; Nock, Borges, Bromet, Alonso, et al., 2008). In the 2008 and 2009 NSDUH, women (3.9%) were more likely than men (3.5%) to report past year active suicidal ideation (Posner et al., 2011), but there were no gender differences in suicide planning or attempts (Crosby et al., 2011). In the 2014 NSDUH, there were no gender differences in past year active suicidal ideation, but women were more likely than men to report past year suicide planning (1.2% vs 1.0%) and attempts (0.5% vs 0.4%; Lipari et al., 2015).

For decades, binge drinking and alcohol use disorder have disproportionately affected emerging adults in the US compared to other ages (Schulenberg et al., 2019). Emerging adults show higher past month binge drinking (34.9% vs 25.1%) and past year alcohol use disorder (10.1% vs 5.1%) compared to adults over 25 (Substance Abuse and Mental Health Services Administration [SAMHSA], 2019). Emerging adults also report higher rates of suicidality compared to older ages. Suicidal ideation, planning, and attempts are higher among emerging adults (11%, 3.4%, and 1.9%, respectively) compared to older adults aged 26–49 (4.7%, 1.4%, 0.6%) and 50+ (2.1%, 0.6%, 0.2%; SAMHSA, 2019). Suicidal ideation, planning, and attempts increased from 2005–2017 in emerging adults, but not adults aged 26–49 and 50+ (Twenge et al., 2019). Increases in suicide attempts have disproportionately occurred in adults ages 18–34 and adults with depressive disorders (Olfson et al., 2017).

Demographic correlates of passive suicidal ideation are understudied. Passive suicidal ideation includes wishes for death and thoughts that life is not worthwhile, without intent or plans to engage suicidal behavior or thoughts of killing oneself (Posner et al., 2011). Two national samples of adults with depressive symptoms reported rates of passive suicidal ideation of 11.3% and 10.2% and risk of suicide attempts was similar among persons with passive and with active suicidal ideation (Baca-Garcia et al., 2011). Indeed, a recent meta-analysis found that passive and active suicidal ideation showed similarly strong relationships with suicide attempts and suicide death (Liu et al., 2020). Since suicidal ideation intensity can vary dramatically over days and hours (Kleiman et al., 2017), it is important to understand the spectrum of suicidality in relation to alcohol use disorder and binge drinking.

Women are more likely to have depressive symptoms and diagnoses compared to men (Salk et al., 2017), while men show consistently higher rates of alcohol use disorder (Grant et al., 2015). However, multiple theoretical frameworks suggest that male depression is under-detected because symptoms are masked by substance use, are under-reported, or are minimized by masculine expectations of affective expression (Addis, 2008). With alternative depression criteria that include substance use, risk taking, and aggression, rates of depression in men exceed that of women (Martin et al., 2013). If men tend to use substances in the context of depressive symptoms like suicidality, comorbid alcohol use disorders and suicidality may be more common in men than women. In addition, younger age of onset is associated with greater severity of alcohol use disorder (Grant et al., 2015) so emerging adults with alcohol use disorder may experience suicidality secondary to distress and impairment associated with severe alcohol use disorder symptoms. Normative and faster improvements in impulse control throughout emerging adulthood are associated with lower alcohol use disorder risk (Littlefield et al., 2010), and lower impulse control is associated with drinking and drinking to cope with emotions (Herman & Duka, 2019). Emerging adults with depressive symptoms may therefore show greater suicide attempt and alcohol use disorder comorbidity compared to older adults.

## Current Study

This study investigated gender and age differences in alcohol use disorders independent of suicidality, suicidality independent of alcohol use disorders, and comorbid alcohol use disorders and suicidality in a national US sample. We aimed to understand relationships between alcohol use disorder and a spectrum of suicidality, ranging from passive suicidal ideation, active suicidal ideation, suicide planning, and suicide attempts. We hypothesized that men would demonstrate higher rates of alcohol use disorder and comorbid alcohol use disorder and suicide attempts, while women would report higher rates of each form of suicidality independent of alcohol use disorder. We expected emerging adults to show higher rates of alcohol use disorder, suicidality, and comorbidity relative to older ages. Second, we investigated gender and age differences in binge drinking independent of suicidality, suicidality independent of binge drinking, and comorbid binge drinking and suicidality. We hypothesized that men and emerging adults would have higher rates of binge drinking and comorbid binge drinking and suicidality, relative to women and older adults, respectively.

## Methods

### Participants

This study used publicly available data from the NSDUH, combining four consecutive years of data from 2015–2018. The NSDUH is a nationally representative, cross-sectional survey of the U.S. civilian population aged 12 or older, who live in non-institutionalized settings (e.g., households, group quarters including college dormitories, and civilians on military bases). SAMHSA conducts this survey annually using a multilevel stratified hierarchical sampling procedure to determine the prevalence of substance use and related disorders in the US. Multi-state area probability sampling creates a nationally representative sample. There are three stages of sample selection: first, within each state, state sampling regions

are formed, roughly based on population. Second, segments are chosen within each census tract with aggregate adjacent census blocks. Third, out of the 48 segments formed, 8 are chosen for any given year of data collection. Lastly, all eligible dwelling units and persons are chosen from within segments (see Center for Behavioral Health Statistics and Quality, 2019 for detailed sampling procedures). Weighted interview response rates were 69.3% in 2015, 68.4% in 2016, 67.1% in 2017, and 66.56% in 2018. The adult representative sample includes 171,766 respondents. For the current analyses, data were restricted to adults who endorsed depression screening items ( $N=29,936$  unweighted) and were therefore administered suicidality items of interest. Of adults who reported depressive symptoms, 476 (1.6%) did not complete the passive suicidal ideation item and were excluded. The final sample ( $N=29,460$  unweighted) is representative of adults with any depressive symptoms (17% of the total 2015–2018 NSDUH sample).

## Procedures

The NSDUH is conducted face-to-face by professional interviewers using computer-assisted personal interviewing and audio computer-assisted self-interviewing. Sampling redesign was conducted in 2014 to redistribute sample sizes by state and age so that the sample derived from each state and age group was more proportional to their relative population sizes (see Center for Behavioral Health Statistics and Quality, 2015). Thus, the 2015–2018 datasets were used given their identical sampling and survey methods for variables of interest. Data collection for the NSDUH is sponsored by SAMHSA and conducted in compliance with the Research Triangle Institute International Institutional Review Board. Secondary analyses of this de-identified data are considered exempt from IRB oversight by the first and senior authors' institution.

## Measures

**Gender.**—Gender was recorded as male or female.

**Age.**—Age was categorized into six groups (18–25 years, 26–34 years, 35–49 years, 50–64 years, 65+).

**Alcohol.**—Diagnosis of either past year DSM-IV alcohol abuse or alcohol dependence indicated presence of an alcohol use disorder. Alcohol abuse was defined as six or more days of alcohol use in the past 12 months and one or more of the following, secondary to alcohol use: (1) problems at work, home, or school; (2) regularly using and engaging in physically dangerous behavior; (3) repeated legal trouble; and (4) continued use despite social problems. Alcohol dependence was defined as six or more days of alcohol use in the past 12 months and three or more of the following, secondary to alcohol use: (1) spent a lot of time on drinking activities, (2) used in greater quantities or for a longer time than intended, (3) developed tolerance, (4) made unsuccessful attempts to cut down or stop, (5) continued use despite physical health or emotional problems, (6) reduced or stopped participating in other activities, and (7) experienced withdrawal symptoms after cutting back or stopping.

Binge drinking was assessed in the prior month, defined as five or more drinks on the same occasion for men and four or more drinks on the same occasion for women.

**Suicidality.**—Four past-year suicidality variables were included: passive suicidal ideation, active suicidal ideation, suicide plans, and suicide attempts. These four items were administered within the depression screening and only to those who screened positively, as defined as endorsing past year depressed and/or anhedonic mood. The NSDUH depression module is based on DSM-IV diagnostic criteria (American Psychiatric Association, 2000). The current version was adapted from the National Comorbidity Survey-Replication interview, which has good concordance with the structured interview used by the World Health Organization and is related to psychosocial impairment (Kessler et al., 2003). Respondents were queried about suicidality during the month of worst depressed and/or anhedonic mood in the past year. Passive suicidal ideation was defined as endorsement of the item “Did you ever think that it would be better if you were dead?” Active suicidal ideation was defined as endorsement of the item “Did you think about committing suicide?” Only persons who active suicidal ideation were asked suicide plans and attempts items (i.e., “Did you make a suicide plan?”; “Did you make a suicide attempt?”).

**Covariates.**—*Race and ethnicity* responses were recoded into non-Hispanic White and Racial/Ethnic Minority (non-Hispanic Black/African American, non-Hispanic Native American/Alaskan Native, non-Hispanic Native Hawaiian or Pacific Islander, non-Hispanic Asian, non-Hispanic Multiracial, or Hispanic). For *educational attainment*, participants were asked their last completed grade and highest degree earned. Responses were recoded as high school graduate or less and compared to more than a high school diploma (e.g., some college, associate’s degree or higher). Household *income* was reported in \$10,000 increments from \$10,000 to \$50,000, \$50,000 to \$74,000, and \$75,000 and higher. *Marital status* was coded as married, never married, or separated/divorced/widowed. Sexual orientation was assessed by “Which one of the following do you consider yourself to be?” with responses “heterosexual, that is, straight”; “lesbian or gay”, or “bisexual”. For these analyses, lesbian/gay and bisexual responses were combined into sexual minority orientation. Responses of “don’t know”, refused, and blank responses were coded as a third category, as older adults may be more likely than younger adults to skip sexual orientation items (Fredriksen-Golsen & Kim, 2015). *Substance use disorder* was assessed with the same criteria as alcohol, with one exception; cannabis use disorder criteria did not include withdrawal. Year of NSDUH administration (2015–2018) was included, given increases in suicidality over time (SAMHSA, 2019).

### Data analytic plan

Multinomial logistic regression models examined gender and age differences in four groups: neither suicidality nor alcohol use disorder, suicidality only, alcohol use disorder only, and both suicidality and alcohol use disorder. Adults with neither passive suicidal ideation nor alcohol use disorder were compared to those with passive suicidal ideation only, alcohol use disorder only, and both passive suicidal ideation and alcohol use disorder. Similar analyses were conducted with each active suicidal ideation, suicide plans, and suicide attempts. Adults with neither suicidality nor alcohol use disorders were the reference group in all

four models. Similar models examined comorbid past-month binge drinking and the four suicidality groups. Regressions without covariates first tested the independent impact of gender and age on alcohol use disorder and suicidality, and binge drinking and suicidality. Due to relationships with alcohol use disorders and/or suicidality, we then controlled for race/ethnicity (Twenge et al., 2019; Vaeth et al., 2017; Williams et al., 2018), income (Grant et al., 2015), educational attainment (Olfson et al., 2017; Rosoff et al., 2019), marital status (Miller-Tutzauer et al., 1991), sexual orientation (Hottes et al., 2016; Medley et al., 2016), and other substance use disorders (Lipari et al., 2015; May & Klonsky, 2016) in all models. Since there were seven income categories, the distribution did not violate normality assumptions, and to reduce lost power from multiple comparisons, income was entered as a continuous variable.

Bonferroni-corrected *p*-values are reported for main effects to reduce Type 1 error risk. Odds ratios (ORs) were converted to percent likelihood odds by: (for ORs < 1) % =  $OR/1+OR$ , or (for ORs 1–1.99) % =  $[(1-OR) \times 100]$ . SPSS Complex Samples Version 26 was used to account for NSDUH sampling procedures (SAMHSA, 2019). Population estimates were calculated across the four years included in this study.

## Results

### Preliminary Analyses

This sample is representative of adults in the US with depressive symptoms (Table 1). More than half (62.6%) was female. Age groups from 18–64 were roughly equal size, while fewer respondents were 65+. The majority identified as non-Hispanic White (74.3%), heterosexual (89.3%), unmarried (58.2%), with more than high school education (71.8%). Among adults with depressive symptoms, 48.4% reported passive suicidal ideation and 37.5% reported active suicidal ideation. Of those with active suicidal ideation, 34.9% reported suicide planning and 23.4% reported suicide attempt(s). Past year alcohol use disorder prevalence was 11.7% and past month binge drinking was 29.6%. Figures 1 and 2 depict rates of suicidality alone, alcohol use disorders alone, and their comorbidity, and of suicidality, binge drinking, and their comorbidity.

### Unadjusted Gender and Age Differences in Comorbid Alcohol Use Disorder, Binge Drinking, and Suicidality

Supplemental tables 1 and 2 show unadjusted models examining gender and age differences in alcohol use disorder and suicidality comorbidities, and in binge drinking and suicidality comorbidities, without accounting for relevant covariates. Men reported higher odds of active suicidal ideation and lower odds of suicide planning than women. Men reported lower odds of suicide attempts (independent of alcohol use disorders) than women. Out of 48 age comparisons, 41 were significant; all but one showed significantly higher odds of suicidality and alcohol use disorder in emerging adults. For binge drinking, men were more likely than women to report comorbid binge drinking and both passive and active suicidal ideation. Thirty-eight age comparisons were significant, all showing higher odds of outcomes in emerging adults. Bolded estimates in supplemental tables show estimates that fell to non-significance in adjusted models.

### Gender and Age Differences in Comorbid Alcohol Use Disorder and Suicidality

Table 2 shows odds ratios for gender and age in alcohol use disorder only, suicidality only, and comorbid alcohol use disorder and suicidality, when accounting for covariates. Men reported 53%–92% increased odds of alcohol use disorder only compared to women. Men and women did not differ in passive suicidal ideation only or suicide attempts only. Men reported 22% higher odds of active suicidal ideation only, whereas women had 47% higher odds of suicide plans. Men were more likely than women to report all four types of suicidality comorbid with alcohol use disorders (ORs=1.38–1.84).

Emerging adults were more likely to report passive suicidal ideation only, active suicidal ideation only, comorbid alcohol use disorder and passive suicidal ideation, and comorbid alcohol use disorder and active suicidal ideation than most older ages. Emerging adults and 35–49-year-olds did not differ in likelihood of alcohol use disorder only. Adults aged 26–34 shows 45% higher odds of alcohol use disorder only compared to emerging adults in passive suicidal ideation analyses, but not other suicidality analyses. Emerging adults reported 65–86% increased odds of alcohol use disorder alone compared to adults aged 50–64 and 2.10–4.49 times the odds of alcohol use disorder alone compared to adults 65+. Emerging adults reported 18%–83% higher odds of passive suicidal ideation only and 1.24–2.06 times higher odds of active suicidal ideation only compared to older ages. Emerging adults reported 1.49–5.76 times higher odds of comorbid alcohol use disorder and passive suicidal ideation and 1.53–6.26 times higher odds of comorbid alcohol use disorder and active suicidal ideation compared to ages 35+. Emerging adults and 26–34-year-olds did not differ in suicide planning, suicide attempts, alcohol use disorder, or their comorbidities.

Emerging adults were 55% more likely than ages 65+ to report suicide planning only. Adults aged 35–49 were 45% *more* likely than emerging adults to report a suicide attempt only. Emerging adults showed 55% higher odds of comorbid alcohol use disorder and suicide planning compared to adults aged 50–64 and 11.67 times higher odds of comorbid alcohol use disorder and suicide plans compared to ages 65+. Emerging adults did not differ from older adults in either comorbid alcohol use disorder and suicide planning or attempts.

### Gender and Age Differences in Comorbid Binge Drinking and Suicidality

Table 3 presents adjusted odds ratios for binge drinking and suicidality and their comorbidities. Men had 12–33% higher odds of binge drinking only compared to women. Men were 36% more likely than women to report active suicidal ideation only. Gender differences in passive suicidal ideation, suicide planning, and suicide attempts were not significant. Men reported 36% higher odds of comorbid binge drinking and active suicidal ideation compared to women. Gender differences in remaining comorbidities were not significant.

Emerging adults had 1.27–4.33 times higher odds of binge drinking only compared to 35+ age groups in all four analyses. Differences in binge drinking between emerging adults and 26–34-year-olds were not significant. Emerging adults reported 19%–94% higher odds of passive suicidal ideation only compared to older ages and 1.28–2.18 times higher odds of reporting active suicidal ideation only compared to older ages. Age differences in suicide



planning only and suicide attempt only were not significant. Emerging adults reported 1.17–7.05 times higher odds of comorbid binge drinking and both passive and active suicidal ideation compared to older ages. With the exception of 26–34-year-olds, emerging adults reported 1.62–27.89 times higher odds of comorbid binge drinking and suicide planning compared to older ages. Emerging adults showed 78% higher odds of comorbid binge drinking and suicide attempts than 50–64-year-olds and 9.55 times higher odds of comorbid binge drinking and suicide attempts than adults 65+.

## Discussion

Findings elucidate gender and age differences in comorbid alcohol use disorder and suicidality and in binge drinking and suicidality. Men were more likely to experience alcohol use disorder independent of suicidality and to experience alcohol use disorder and suicidality comorbidity across severity of suicidality from passive suicidal ideation to suicide attempts. Emerging adults consistently reported higher comorbid suicidal ideation, alcohol use disorder, and binge drinking than adults 35+. Emerging adults reported more severe suicidality and both alcohol use disorder and binge drinking than adults 50+.

In contrast to higher rates of active suicidal ideation among women in general population samples (Nock et al., 2008) but similar adults with major depressive disorder in the NSDUH (Cheek et al., 2016), this study found higher rates of active suicidal ideation among men with depressive symptoms. Similar to higher rates of suicide attempts in women compared to men in the NSDUH (Crosby et al., 2011) and the National Comorbidity Survey–Replication (Nock & Kessler, 2006), women in this study showed higher rates of suicide planning compared to men. However, gender differences in suicide attempts were not significant when accounting for covariates, suggesting other demographic factors may account for women's increased odds of suicide attempts. Notably, the present study included only those with depressive symptoms. Men's suicidal ideation may have increased, as the current study used data from 2015–2018, while Crosby and colleagues (2011) analyzed 2008 NSDUH data. Men showed higher likelihood of comorbid alcohol use disorder and suicide planning and attempts than women, but not comorbid binge drinking and suicide planning or attempts. Alcohol use disorder, compared to binge drinking, may have stronger relationships with severe suicidality. Binge drinking may be more normative and not infer the same level of predisposition or shared genetic risk as alcohol use disorder and suicidality (Brady, 2006).

Emerging adults showed striking profiles of suicidal ideation and both comorbid alcohol use disorder and binge drinking. Emerging adults were also overrepresented in comorbidities with more severe suicidality (i.e., alcohol use disorder and suicide planning, binge drinking and suicide planning, binge drinking and suicide attempt). Adults with chronic suicidality may have died by suicide or other causes by later adulthood, which would mean this study compared emerging adults to older adults who may think about, but not engage in suicidal behavior. However, higher rates of suicidality and alcohol use disorders observed during emerging adulthood likely highlight this developmental stage as a true period of risk, in line with elevated rates of mental health and substance use disorders in this age group (Kessler et al., 2007); such problems tend to subside over time for many people (Gustavson et al., 2018). Arnett (2005) suggests that emerging adults use alcohol because

of developmental processes, such as the stress of feeling ‘in-between’ adolescence and adulthood, experimentation and risk taking, living with peers rather than family, and low consideration of consequences. Stress and instability in emerging adulthood may contribute to suicidality; however, alcohol use may also contribute to suicidality and vice versa, or these two problems could present concurrently.

Although we have discussed these findings primarily in terms of age effects, cohort effects may be impacting results. For example, participants who were emerging adults during the time of data collection fall into either Generation Z or Generation Y/Millennials. These cohorts may have increased incidence of mental health problems and greater stress related to gun violence, climate change, rising suicide rates, separation and deportation of immigrant families, and sexual harassment relative to older cohorts (American Psychological Association, 2018). The study design does not allow for disentangling age and cohort effects so findings may not fully apply to future or past cohorts of emerging adults.

This study expands the knowledge base on passive suicidal ideation, which many have argued is clinically distinct from active suicidal ideation (Baca-Garcia et al., 2011). Passive suicidal ideation literature has focused on veterans (Kimbrel et al., 2015; May et al., 2015; Pfeiffer et al., 2014) and emergency department patients (Allen et al., 2013) and primarily in relation to suicidal behavior (Baca-Garcia et al., 2011). The current study extends this research by identifying relatively high rates of comorbid passive suicidal ideation and both alcohol use disorder and binge drinking in a representative US sample with depressive symptoms. Notably, men reported higher rates of comorbid alcohol use disorder and passive suicidal ideation than women, but similar rates of passive suicidal ideation alone. Men reported higher rates of active suicidal ideation alone, comorbid alcohol use disorder and active suicidal ideation, and comorbid binge drinking and active suicidal ideation. Similarities across men and women in passive suicidal ideation, and differences in active suicidal ideation (independent of alcohol use disorder and binge drinking), supports conceptualizing passive and active suicidality as distinct experiences with different correlates.

Underlying processes related to binge drinking, alcohol use disorder, and suicidality may overlap and contribute to comorbidity. Alcohol use disorder increases predisposition for suicide attempts (e.g., social problems, impulsivity, aggression), and intoxication directly increases risk for suicide attempt by lowering inhibitions and increasing depressed mood, hopelessness, stressful events, and suicidal ideation (Lamis & Malone, 2012; Norström & Rossow, 2016). In one clinical study in Germany, comorbid alcohol use disorder and suicide attempts were more common among men and older adults than women and younger adults (Boenisch et al., 2010). In the present study of adults with depressive symptoms in the US, men and younger adults were most likely to have comorbid alcohol use disorder and suicide attempts, but no age differences were apparent for comorbid binge drinking and suicide attempts. Men and emerging adults may have more psychological vulnerability for suicidality or are more prone to interpersonal conflict, life stressors, hopelessness or aggression while drinking, which in turn increase risk for suicidality. Alcohol use disorder is also associated with impulsive suicide attempts (i.e., no reported premeditation; Spokas et

al., 2012); emerging adults do not yet possess fully developed executive functioning capacity for impulse-control (Littlefield et al., 2010) and may therefore be more prone to suicide attempts secondary to alcohol use.

Several limitations are worth mentioning. First, death by suicide or from complications due to alcohol use disorder were not considered; both causes of death are higher in middle-age and older adults compared to emerging adults (Hedegaard et al., 2020; White et al., 2020). Second, respondents needed to be willing to participate in an audio-assisted self-guided interview and report depressive symptoms. Although suicidality is common among persons with depressive disorders, it is not pathognomonic of depression and occurs across psychopathology (e.g., anxiety disorders; Bomyea et al., 2013) and independent of mental health diagnosis (Nock et al., 2019). Therefore, findings apply specifically to those with subclinical and clinical depression. Age by gender interactions were attempted, but did not run, perhaps due to categorical age groups in the public NSDUH data. Additionally, some distinct covariate groups were collapsed into less specific groupings to provide stable estimates (e.g., separated, divorced, and widowed people were collapsed into a single marital status group; racial/ethnic groups had to be collapsed into a dichotomous variable in order for models to converge). Lastly, mechanisms that may explain gender and age differences in alcohol use disorder, binge drinking, and suicidality, such as experiences of sexism, gendered emotional expression, and developmental stressors, were not assessed.

Future studies should examine comorbidity between alcohol use disorder and suicidality in population-based samples irrespective of depressive symptoms. Studies with additional years (i.e., at least seven years for joint point regressions) could test longitudinal differences in prevalence of alcohol use disorder, suicidality, and their comorbidity by gender and age. Additional theory-driven research could elucidate *why* men and emerging adults were more likely to report comorbid alcohol use disorder and suicidality and binge drinking and suicidality, such as differences in constructs proposed by the interpersonal psychological theory (Joiner, 2005; Van Orden et al., 2010).

Results have important public health and clinical implications. This study strengthens the rationale for recommendations for depression screenings on college campuses (American College Health Association, 2010) and in primary care (Siu et al., 2016), as well as alcohol and suicide screenings in these settings (American College Health Association, 2010; Curry et al., 2018; Kaplan et al., 2014; LeFevre & Force, 2014; Siu et al., 2016). Healthcare providers should be aware of the higher prevalence of comorbid alcohol use disorder and suicidal ideation among men and emerging adults. Interventions for binge drinking should include skills to manage passive and active suicidal ideation, to prevent worsening suicidality. The consistent risk profile for emerging adults suggests that, while college campuses are directing resources toward alcohol safety and reducing alcohol consumption (Carey et al., 2016; Scott-Sheldon et al., 2014), such interventions should be bolstered with suicide safety planning. Large scale depression screening efforts on college campuses and clinical settings may need to increase their *capacity* for alcohol and suicidality screenings as well as access to interventions for alcohol, depression, and suicidality. Public health efforts, like the truth® campaign which was associated with reductions in tobacco use among young adults (Vallone et al., 2017), should be applied to binge drinking. Population-level initiatives

are needed to support the millions of adults struggling with suicidality, alcohol use disorder, and binge drinking.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data used in the current study are publicly available from the Substance Abuse and Mental Health Data Archive (<https://datafiles.samhsa.gov/info/browse-studies-nid3454>). Manuscript preparation for this study was funded in part by the T32AA007290 that covered Dr. Kelly's time, as well as K23DA034879, R01MD013550, RF1MH120830, R01MH101138, and R01MH115905. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or SAMHSA.

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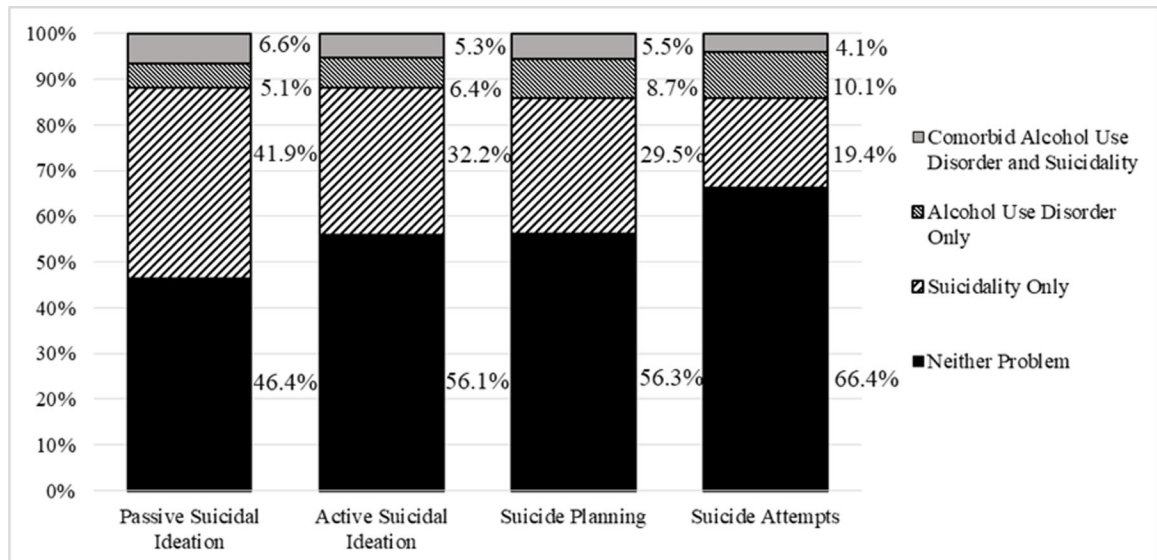
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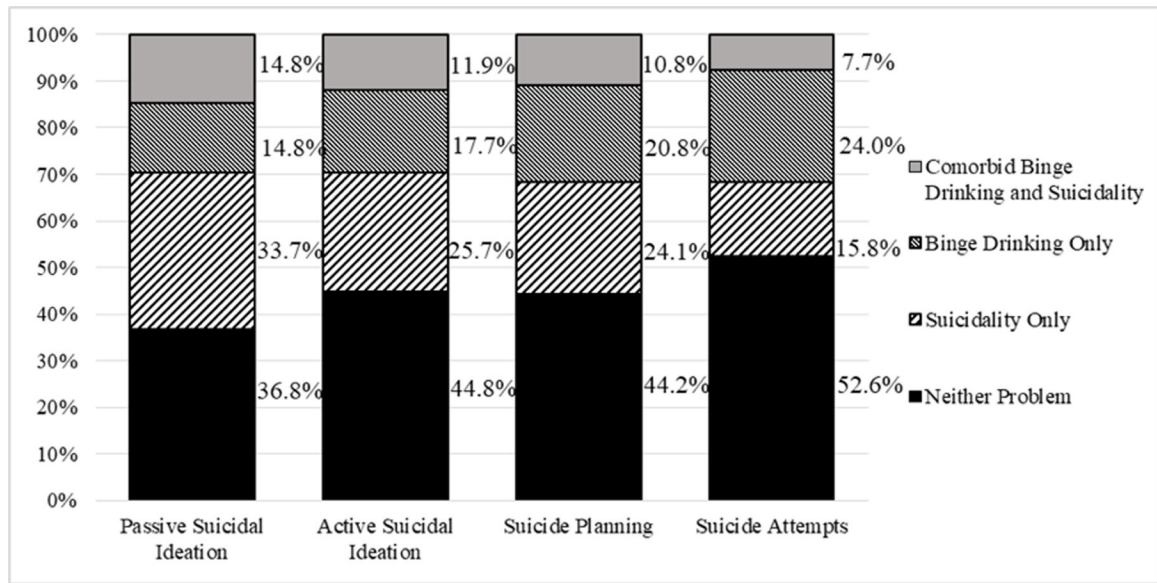


### Highlights

- In adults with depressive symptoms, rates of alcohol use disorder, binge drinking, and suicidality are higher in some groups
- Men and emerging adults were more likely than women and older adults to have both alcohol use disorder and suicidality
- Men and emerging adults showed higher rates of both binge drinking and suicidal thoughts than women and older adults
- Clinicians should be aware of high rates of suicidality in adults with alcohol use disorders, particularly men and emerging adults
- Suicide prevention should be part of alcohol use disorder prevention and treatment



**Figure 1.** Rates of Alcohol Use Disorder Only, Suicidality Only, and Their Comorbidities across the Four Types of Suicidality  
 Note. Numbers on the vertical axis and in each subsection of the bars indicate the percent of the sample (i.e., adults who endorsed depressive symptoms) reporting each problem (e.g., 6.6% of the adults in the United States who report any depressive symptoms have comorbid alcohol use disorder and passive suicidal ideation). Each bar represents one of the four types of suicidality (passive suicidal ideation, active suicidal ideation, suicide planning or suicide attempts).



**Figure 2.** Rates of Binge Drinking Only, Suicidality Only, and Their Comorbidities across the Four Types of Suicidality

Note. Numbers on the vertical axis and in each subsection of the bars indicate the percent of the sample (i.e., adults who endorsed depressive symptoms) reporting each problem (e.g., 14.8% of the adults in the United States who report any depressive symptoms have comorbid binge drinking and passive suicidal ideation). Each bar represents one of the four types of suicidality (passive suicidal ideation, active suicidal ideation, suicide planning or suicide attempts).

**Table 1**Demographic Characteristics ( $N= 29,460$ )

	Unweighted $n$	Weighted $SE$	Weighted %
Total	29,460	1,206,320	100
Year			
2015	7,153	678,934	24.1
2016	7,170	670,621	24.2
2017	7,530	804,123	26.1
2018	7,607	681,144	25.6
Gender			
Male	10,524	669,403	37.4
Female	18,935	954,303	62.6
Age			
18–25 years	11,144	383,509	18.8
26–34 years	6,321	391,051	18.8
35–49 years	7,726	575,083	26.6
50–64 years	3,016	686,170	24.5
65 and older	1,253	697,055	11.3
Race/Ethnicity			
Non-Hispanic White	20,429	1,161,468	74.2
Racial/ethnic minority	0.031	608,200	25.8
Education			
High school or less	9,248	586,562	28.2
> High school	20,212	1,115,430	71.8
Income			
Less than \$10,000	2,992	344,610	7.7
\$10,000-\$19,999	3,580	432,619	10.6
\$20,000-\$29,999	3,244	338,567	9.8
\$30,000-\$39,000	3,031	366,029	9.7
\$40,000-\$49,000	2,965	416,528	9.8
\$50,000-\$74,000	4,554	538,665	16.2
\$75,000 or more	9,050	795,732	36.2
Marital Status			
Married	9,578	981,549	41.7
Widowed/divorced/separated	4,680	480,224	22.4
Never been married	15,202	656,978	35.9
Sexual orientation			
Heterosexual/Straight	24,967	1,109,408	88.8
Lesbian/Gay/Bisexual	4,284	375,010	10.6
Don't know, did not answer	209	97,924	0.6

	Unweighted <i>n</i>	Weighted <i>SE</i>	Weighted %
Substance Use Disorder	2,733	287,335	7.3
Passive Suicidal Ideation	15,259	763,288	48.4
Active Suicidal Ideation	12,157	668,485	37.5
Suicide Plan	4,580	324,133	34.9
Suicide Attempt	3,091	323721	23.5
Alcohol Use Disorder	4,157	364,607	11.7
Binge Drinking	10,036	641,508	29.5

Notes. Alcohol and substance use disorders were assessed within the past year. Sample sizes for suicidality items differ: passive suicidal ideation = 29,460; active suicidal ideation = 29,415; suicide plan = 12,154; suicide attempt 12,139 (unweighted *n*'s). Suicide plan and attempt items were only answered by those who endorsed active suicidal ideation.

**Table 2.**

Alcohol Use Disorders and Suicidality Comorbidity by Gender and Age

	Gender			Wald $\chi^2$	Age				
	Wald $\chi^2$	OR Male [95% CI]			OR 26–34 [95% CI]	OR 35–49 [95% CI]	OR 50–64 [95% CI]	OR 65+ [95% CI]	
Passive SI and AUD	80.85 ***			199.48 ***					
Passive SI Only		.96 [.90–1.04]	M=W		1.18 *** [1.08–1.30]	1.31 *** [1.16–1.48]	1.28 *** [1.14–1.45]	1.83 *** [1.53–2.19]	18–25>26+
AUD Only		1.92 *** [1.58–2.32]	M>W		.83 * [.69–1.0]	1.10 [.87–1.39]	1.69 ** [1.23–2.31]	4.49 *** [2.51–8.04]	18–25<26–34 1825>50+
AUD+Passive SI		1.53 [1.34–1.74] ***	M>W		1.17 [.97–1.41]	1.49 *** [1.25–1.77]	2.03 *** [1.55–2.66]	5.76 *** [3.79–8.76]	18–25>35+
Active SI and AUD	101.99 ***			213.59 ***					
Active SI Only		1.22 *** [1.12–1.32]	M>W		1.24 *** [1.13–1.36]	1.42 *** [1.27–1.58]	1.52 *** [1.33–1.74]	2.06 *** [1.68–2.54]	18–25>26+
AUD Only		1.89 *** [1.61–2.21]	M>W		.88 [.74–1.04]	1.16 [.92–1.46]	1.71 *** [1.28–2.29]	4.33 *** [2.57–7.31]	18–25>50+
AUD+Active SI		1.84 *** [1.57–2.17]	M>W		1.19 [.97–1.46]	1.53 ** [1.26–1.85]	2.34 *** [1.73–3.16]	6.26 *** [3.32–11.81]	18–25>35+
Suicide Plan and AUD	37.86 ***			37.56 ***					
Suicide Plan Only		.89 * [.80–.99]	M<W		1.12 [.96–1.32]	1.09 [.94–1.26]	1.16 [.93–1.44]	1.55 ** [1.13–2.14]	18–25>65+
AUD Only		1.49 *** [1.25–1.78]	M>W		.94 [.71–1.24]	1.00 [.79–1.27]	1.65 * [1.10–2.49]	2.10 * [1.02–4.30]	18–25>50+
AUD+Suicide Plan		1.46 * [1.09–1.95]	M>W		1.09 [.85–1.41]	1.23 [.92–1.64]	1.62 * [1.02–2.56]	11.67 * [1.74–78.31]	18–25>50+
Suicide Attempt and AUD	30.50 ***			42.59 **					
Suicide Attempt Only		.86 [.75–1.00]	M=W		.99 [.83–1.18]	.99 [.79–1.23]	1.09 [.84–1.41]	1.40 [.93–2.10]	18–25 = 26+
AUD Only		1.53 *** [1.28–1.82]	M>W		.92 [.71–1.20]	.91 [.79–1.05]	1.86 *** [1.35–2.57]	2.68 * [1.20–5.60]	18–25>50+
AUD+Suicide Attempt		1.38 * [1.07–1.79]	M>W		1.04 [.79–1.38]	1.17 [.83–1.66]	1.11 [.71–1.73]	4.62 [.94–22.76]	18–25=26+

Note.

\*\*\* p<.001,

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p<.01,

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p<.05.

AUD = alcohol use disorders. SI = suicidal ideation. Neither suicidality nor alcohol use disorders are the dependent reference group in all four analyses. For gender, female = reference group. For age, 18–25-year-olds = reference group; odds ratios compare 18–25-year-olds to each older age group, with odds ratios over 1.0 meaning greater likelihood among 18–25-year-olds compared to older age groups. Analyses control for year, race/ethnicity, education, income, marital status, sexual orientation, and other substance use disorder. Bonferroni corrections are applied to *p*-values for main effects.

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**Table 3.**

Binge Drinking and Suicidality Comorbidity by Gender and Age

	Gender			Age					
	Wald $\chi^2$	OR Male [95% CI]		Wald $\chi^2$	OR 26–34 [95% CI]	OR 35–49 [95% CI]	OR 50–64 [95% CI]		
Passive SI and Binge Drinking	28.71 ***			573.15 ***					
Passive SI Only		1.02 [.94–1.49]	M=W		1.19 ** [1.06–1.34]	1.34 *** [1.17–1.61]	1.37 *** [1.20–1.56]	1.94 *** [1.63–2.31]	18–25>26+
Binge Drinking Only		1.33 *** [1.19–1.49]	M>W		.94 [.81–1.09]	1.37 *** [1.17–1.61]	2.30 *** [1.92–2.75]	4.33 *** [3.09–6.07]	18–25>35+
Binge+Passive SI		1.10 [.99–1.21]	M=W		1.17 * [1.04–1.33]	1.79 *** [1.52–2.12]	2.56 *** [2.15–3.05]	6.67 *** [5.05–8.80]	18–25>26+
Active SI and Binge Drinking	59.95 ***			472.43 ***					
Active SI Only		1.26 *** [1.16–1.37]	M>W		1.28 *** [1.13–1.45]	1.42 *** [1.25–1.62]	1.62 *** [1.40–1.87]	2.18 *** [1.80–2.64]	18–25>26+
Binge Drinking Only		1.29 *** [1.17–1.42]	M>W		.98 [.86–1.12]	1.37 *** [1.19–1.58]	2.27 *** [1.91–2.68]	4.30 *** [3.16–5.85]	18–25>35+
Binge+Active SI		1.36 *** [1.22–1.52]	M>W		1.20 ** [1.07–1.34]	1.91 *** [1.62–2.26]	2.90 *** [2.37–3.54]	7.05 *** [4.82–10.32]	18–25>26+
Suicide Plan and Binge Drinking	5.65			137.77 ***					
Suicide Plan Only		.91 [.79–1.04]	M=W		1.04 [.87–1.24]	1.01 [.85–1.21]	1.10 [.85–1.43]	1.32 [.96–1.84]	18–25>26+
Binge Drinking Only		1.08 [.93–1.26]	M=W		.87 [.73–1.04]	1.22 [.99–1.49]	1.73 *** [1.36–2.21]	2.24 *** [1.46–3.44]	18–25>50+
Binge+Suicide Plan		1.0 [.85–1.16]	M=W		1.11 [.89–1.40]	1.62 *** [1.27–2.06]	2.12 *** [1.55–2.89]	27.89 *** [7.86–98.93]	18–25>35+
Suicide Attempt and Binge Drinking	8.53			148.59 ***					
Suicide Attempt Only		.93 [.79–1.08]	M=W		.89 [.72–1.09]	.88 [.73–1.05]	.99 [.74–1.32]	1.20 [.80–1.78]	18–25>26+
Binge Drinking Only		1.12 * [1.0–1.26]	M>W		.86 [.72–1.03]	1.27 * [1.05–1.55]	1.79 *** [1.42–2.26]	2.72 *** [1.78–4.16]	18–25>35+
Binge+Suicide Attempt		.90 [.74–1.10]	M=W		1.08 [.82–1.43]	1.37 * [1.02–1.84]	1.78 ** [1.20–2.64]	9.55 *** [3.23–28.26]	18–25>35+

Note.

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p<.001,



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p<.01,

\*  
p<.05.

SI = Suicidal ideation. Neither suicidality nor binge drinking is the dependent reference group in all four analyses. For gender, female = reference group. For age, 18–25-year-olds = reference group; odds ratios compare 18–25-year-olds to each older age group, with greater odds ratios over 1.0 meaning greater likelihood among 18–25-year-olds compared to older age groups. Analyses control for year, race/ethnicity, education, income, marital status, sexual orientation, and other substance use disorder. Bonferroni corrections are applied to *p*-values for main effects.

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