Characterizing Alcohol Use Disorders and Suicidal Ideation in Young Women

ARPANA AGRAWAL, PH.D.,^{a,*} ANNA M. CONSTANTINO, B.A.,^a KATHLEEN K. BUCHOLZ, PH.D.,^a
ANNE GLOWINSKI, M.D., M.P.E.,^a PAMELA A. F. MADDEN, PH.D.,^a ANDREW C. HEATH, D.PHIL.,^a
AND MICHAEL T. LYNSKEY, PH.D.,^a

^aDepartment of Psychiatry, Washington University School of Medicine, Saint Louis, Missouri

ABSTRACT. Objective: Alcohol use disorders (AUDs) and suicidal ideation (SI) co-occur, yet few studies have investigated the risk and protective factors that influence their comorbidity. **Method:** Data from 3,787 twin women ages 18–27 years were analyzed. AUD was defined as a lifetime history of alcohol abuse or dependence as defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*. SI was coded as a lifetime report of any SI, and all subjects were queried about SI. Subjects were divided into those with neither AUD nor SI (AUD–SI–), those with AUD but no SI (AUD+SI–), those with SI but no AUD (AUD–SI+), and those with comorbid AUD and SI (AUD+SI+). Association with multiple measures of psychopathology, negative life events, personality, and family history was assessed using multinomial

logistic regression. **Results:** Women with AUD were at 3.1 (95% confidence interval [2.5, 3.8]) odds of also reporting a lifetime history of SI. Psychopathology and negative life events were consistently high in the AUD+SI+ group. AUD+SI+ women also were more likely to report drinking to cope. Substance use was more common in the AUD+SI– versus the AUD–SI+ women, whereas major depressive disorder, social phobia, and panic attacks were more commonly reported by the AUD–SI+ versus the AUD+SI– women. **Conclusions:** The comorbidity between AUD and SI is characterized in young women by co-occurring psychopathology, drinking to cope, and negative life events. (*J. Stud. Alcohol Drugs*, 74, 406–412, 2013)

SIGNIFICANT MORBIDITY AND MORTALITY are associated with alcohol use disorders (AUDs; i.e., alcohol abuse/dependence), which are common and serious psychiatric illnesses. In addition to medical morbidity and adverse physical health outcomes, a number of comorbid psychiatric problems co-aggregate with AUDs, including other substance use disorders (Grant et al., 2004); major depressive disorder (Hanna and Grant, 1997; Hasin et al., 2005; Helzer and Pryzbeck, 1988); conduct and antisocial personality disorder (Goldstein et al., 2007); and, importantly, suicide (Conner and Chiapella, 2004).

From 1999 to 2004, suicide was the third leading cause of death among U.S. youths ages 10–24 years, with a rate of 11.0 per 100,000 in 2005 (World Health Organization, 2011). Data from the 2008–2009 National Household Sur-

vey of Drug Use and Health show that 3.7% of those ages 18 years and older reported suicidal thoughts (Crosby et al., 2011). The first stage in suicidal behavior is suicidal ideation (SI; i.e., ever thinking of taking one's life), a common mental health problem (Nock et al., 2008). In epidemiological surveys, 8.4%–9.7% of the U.S. population reported a lifetime history of SI (Baca-Garcia et al., 2010), with 2.8%–3.3% reporting SI in the past 12 months (Kessler et al., 2005). Rates are higher in youths, with 13.8% of those in the 9th–12th grade reporting serious SI (Centers for Disease Control and Prevention, 2010).

In Europe and North America, AUDs are among the leading contributors to suicide (World Health Organization, 2000). Those with AUDs are more vulnerable to suicide (Murphy and Wetzel, 1990; Nock et al., 2009, 2010), with a meta-analysis showing that those with AUDs are at a nearly 10 times increased risk for completed suicide (Wilcox et al., 2004). In an international study, those reporting SI were at increased odds of also meeting criteria for AUDs, with the odds being as high as 4.8 in developing countries (Nock et al., 2009). What distinguishes those with comorbid AUD and SI from those with SI but no AUD and AUD without SI remains relatively unexplored. Influences on AUDs and SI include sociodemographic factors (e.g., educational attainment), life events (e.g., traumatic events), and comorbid psychopathology, the most recognized being major depressive disorder and conduct disorder (Kendler, 2010; Nock et al., 2009). However, the extent to which these factors influence the lifetime comorbidity between AUD and SI remains less well understood. In this epidemiologic study of 3,787 young

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*Correspondence may be sent to Arpana Agrawal at the Washington University School of Medicine, Dept. of Psychiatry, 660 S. Euclid, CB 8134, St. Louis, MO 63110, or via email at: arpana@wustl.edu.

women, we delineated factors that differentiate individuals with AUD without a lifetime history of SI, those with SI without a lifetime history of AUD, and those with a lifetime history of both SI and AUD within the context of sociodemographic factors, life events, psychopathology, aspects of suicidal behavior, and drinking.

Method

Sample

Data for this study are drawn from the Missouri Adolescent Female Twin Study, a cohort of same-sex female twin pairs identified from birth records who were born between July 1, 1975, and June 30, 1985 (Heath et al., 2002). Using a cohort-sequential sampling design, twins and their parents were invited to take part in the baseline interviews, with at least one biological parent interviewed (generally the mother), during 1994–1999 when the twins were 13, 15, 17, or 19 years old. Further details regarding sample recruitment, and characteristics of this first wave of interview data, are given elsewhere (Knopik et al., 2005). Because the baseline assessment was targeted at behaviors specific to childhood and adolescence, not all measures of psychopathology, substance involvement, and behavior were administered. During 2002–2005, all eligible twins, regardless of whether they had participated in the baseline assessments (and as long as they had not declined to participate in future interviews), were invited to participate in the first full-length adult follow-up interview. This sample ($N = 3,787$; 14.6% African American, with the remainder of European American ancestry) represented 80% of live-born female twins identified via state birth records and was used for the current analyses.

Measures

An adapted version of the Semi-Structured Assessment for the Genetics of Alcoholism (Bucholz et al., 1994) was administered by telephone interview. In addition, data from mailed questionnaires, including items assessing personality and drinking motives, were used.

Alcohol use disorders. Alcohol abuse and dependence were diagnosed using criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994). A lifetime diagnosis of AUD was made if the participant met criteria for DSM-IV abuse or dependence.

Suicidal ideation. SI was assessed in a section that was independent from the diagnostic section on major depressive disorder. Hence, all subjects were queried about whether they had ever thought about taking their own life, which was used to code SI.

Covariates

Sociodemographics. Age (dichotomized as 18–21 years vs. 22–27 years), ethnicity (African-American or European American), zygosity (identical or fraternal), and high school completion were drawn from the interview.

Negative life events. Measures included self-reported parental divorce or separation; whether the respondent was ever divorced or separated; and measures related to childhood sexual abuse, childhood physical abuse, ever being raped or molested, and experiencing any assaultive or non-assaultive trauma.

Psychopathology and drug use. This section included DSM-IV lifetime diagnoses of major depressive disorder, social phobia, panic attacks, conduct disorder, regular cigarette smoking (determined by respondent's report of smoking 100 or more cigarettes in her lifetime or smoking 20–99 cigarettes in her lifetime and smoking nearly every day for a period of 2 months), nicotine dependence, and the use of cannabis and other illicit drugs.

Suicidal behavior. In addition to SI, we examined both self-reported lifetime suicide attempt and self-report of ever discussing the suicide attempt with a healthcare professional.

Alcohol consumption. In addition to AUD, we examined early onset of drinking (dichotomized as ≤ 14 years vs. > 14 years), maximum number of drinks consumed in a single 24-hour period, and whether the respondent had received treatment for an alcohol-related problem. We also coded coping and enhancement motives for drinking drawn from the Drinking Motives Questionnaire (Cooper, 1994).

Family history. Respondents' reports of their co-twin's and biological parents' history of suicide attempt and alcohol problems were drawn from the Family History Assessment Module (Rice et al., 1995).

Personality. From the questionnaires, scores for neuroticism, extroversion, openness, agreeableness, and conscientiousness were drawn from the short form of the NEO Personality Inventory (Costa and McCrae, 1985), whereas control (reverse-coded to represent impulsivity) and aggression were drawn from the Multidimensional Personality Questionnaire (Tellegen, 1982).

Statistical methods

Using lifetime AUD and SI, four groups were created: AUD–SI– (neither AUD nor SI), AUD+SI– (AUD without SI), AUD–SI+ (SI without AUD), and AUD+SI+ (both AUD and SI). Prevalence of individual sociodemographics, life events, psychopathology, suicidal behavior, and drinking characteristics were computed in SAS (SAS Institute Inc., Cary, NC) for each of these four groups of individuals. Multinomial odds ratios (ORs) were computed in Stata (StataCorp LP, College Station, TX) using a robust variance estimator to account for familial cluster-

TABLE 1. Prevalence or mean of sociodemographic, life event, psychopathology and drug use, suicidality and drinking characteristics in young adult women from MOAFTS ($N = 3,787$) stratified by lifetime history of DSM-IV alcohol use disorder (AUD) and suicidal ideation (SI)

Correlates	Neither AUD nor SI ($n = 2,822$) % or M (SD)	AUD without SI ($n = 282$) % or M (SD)	SI without AUD ($n = 524$) % or M (SD)	Both SI and AUD ($n = 160$) % or M (SD)
Sociodemographic characteristics				
≤21 years of age	51.52	44.33	45.61	35.00
African American	14.46	8.16	19.31	13.75
Zygosity (MZ)	46.28	47.87	47.23	45.00
High school educated	58.07	53.05	51.54	44.94
Negative life events				
Parental divorce	17.47	26.95	19.47	23.75
Childhood physical abuse	9.11	16.31	25	34.38
Childhood sexual abuse	6.75	12.81	26.96	39.62
Ever raped/molested	8.43	15.25	31.87	49.38
Separated from spouse/partner, if married	8.58	14.54	15.08	26.25
Assaultive trauma	19.45	36.17	47.14	63.75
Non-assaultive trauma	24.88	40.07	40.65	52.5
Psychopathology and drug use				
Major depressive disorder	11.98	25.89	50.38	71.25
Social phobia	2.59 ^a	3.9	12.02	17.5 ^b
Panic disorder	7.41	18.44	28.05	41.25
Conduct disorder	1.26	7.49	7.86	18
Regular smoker	30.33	62.41	42.18	73.75
Nicotine dependence	11.59	39.72	24.62	57.5
Cannabis use	35.83	76.24	50.57	90
Other drug use	10.99	38.65	26.34	68.75
Suicidal behavior				
Suicide attempt	0.14	0.35	25.95	34.38
Discussed attempt with health care professional	0.14	0.35	16.03	17.5
Alcohol consumption				
Early onset of drinking	27.71	33.33	31.11	43.75
Maximum drinks, 24 hours	8.85 (6.53)	16.24 (9.52)	11.08 (9.33)	19.12 (13.34)
Alcohol treatment	0.67	8.16	3.24	28.75
Drinking motives				
Coping mechanisms	0.69 (0.89)	1.50 (1.09)	0.94 (1.06)	2.05 (1.28)
Enhancement mechanisms	1.57 ^a (1.22)	2.58 ^b (1.20)	1.53 ^a (1.26)	2.64 ^b (1.26)
Family history				
Twin suicide attempt	2.66	5.32 ^a	8.78 ^{a,b}	13.13 ^b
Parental suicide attempt	3.22	6.38 ^a	9.35 ^a	18.13
Twin alcohol problem	2.23	7.8 ^a	5.92 ^a	18.13
Parental alcohol problem	15.84	29.43 ^a	24.62 ^a	38.75
Personality traits				
Neuroticism	1.61 (0.58)	1.81 (0.58)	2.12 ^a (0.64)	2.25 ^a (0.73)
Extroversion	2.53 ^a (0.49)	2.56 ^a (0.46)	2.32 ^b (0.54)	2.34 ^b (0.59)
Openness	2.10 (0.46)	2.19 ^a (0.44)	2.26 ^a (0.52)	2.30 ^a (0.56)
Agreeableness	2.80 (0.45)	2.64 ^a (0.49)	2.63 ^a (0.50)	2.40 (0.52)
Conscientiousness	2.80 (0.49)	2.59 ^a (0.52)	2.62 ^a (0.54)	2.41 (0.50)
Impulsivity	1.51 ^a (0.39)	1.69 ^b (0.43)	1.54 ^a (0.42)	1.74 ^b (0.43)
Aggression	0.98 (0.58)	1.18 ^a (0.66)	1.17 ^a (0.71)	1.44 (0.82)

Notes: Means with the same superscripts are statistically equated to each other in analysis of variance models. MOAFTS = Missouri Adolescent Female Twin Study; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; MZ = monozygotic.

ing, comparing the effect of covariates across AUD+SI-, AUD-SI+, and AUD+SI+, with AUD-SI- as the reference group. Post hoc Wald chi-square tests were conducted for all across-group comparisons. For continuous measures, group means (across-group mean differences) were compared using analysis of variance in SAS. All analyses were univariate.

Results

Prevalence of alcohol use disorders and suicidal ideation

In our sample, 18% reported SI and 11.7% met criteria for a lifetime history of AUD. AUD and SI were strongly associated ($OR = 3.1$, 95% CI [2.5, 3.8]). Of the full sample,

TABLE 2. Relative risk ratios (RRRs) (with 95% confidence intervals [CIs] in brackets) from univariate multinomial logistic regression models (those with neither alcohol use disorder [AUD] nor suicidal ideation [SI] serve as the reference group)

Correlates	AUD without SI RRR [95% CI]	SI without AUD RRR [95% CI]	Both AUD and SI RRR [95% CI]
Sociodemographic			
≤21 years of age	0.75 ^{N.S.} [0.58, 0.97]	0.79 ^{N.S.} [0.64, 0.97]	0.51 [0.35, 0.73]
African American	0.53 ^{N.S.} [0.33, 0.84]	1.42 ^{N.S.} [1.09, 1.83]	0.94 ^{N.S.} [0.570, 1.55]
Zygoty (MZ)	0.94 ^{N.S.} [0.72, 1.21]	0.96 ^{N.S.} [0.79, 1.18]	1.05 ^{N.S.} [0.75, 1.48]
High school education	0.82 ^{N.S.} [0.63, 1.05]	0.77 ^{N.S.} [0.63, 0.94]	0.59 [0.42, 0.82]
Negative life events			
Parental divorce	1.74 [1.30, 2.34]	1.14 ^{N.S.} [0.89, 1.47]	1.47 ^{N.S.} [0.99, 2.18]
Childhood physical abuse	1.94 [1.37, 2.76]	3.33 [2.63, 4.21]	5.23 [3.64, 7.50]
Childhood sexual abuse	2.03 [1.36, 3.03]	5.10 [3.93, 6.60]	9.06 [6.34, 12.96]
Ever raped/molested	1.95 [1.35, 2.82]	5.08 [4.00, 6.45]	10.59 [7.48, 14.99]
Separated from spouse/partner, if married	1.81 ^a [1.26, 2.60]	1.89 ^a [1.42, 2.52]	3.79 [2.62, 5.51]
Assaultive trauma	2.35 [1.79, 3.07]	3.69 [3.01, 4.53]	7.28 [5.12, 10.36]
Non-assaultive trauma	2.02 ^a [1.55, 2.63]	2.07 ^a [1.70, 2.51]	3.34 [2.40, 4.64]
Psychopathology and drug use			
Major depressive disorder	2.57 [1.92, 3.42]	7.46 [6.05, 9.20]	18.21 [12.62, 26.28]
Social phobia	1.53 ^{N.S.} [0.80, 2.91]	5.15 ^a [3.61, 7.34]	7.99 ^a [4.88, 13.08]
Panic attacks	2.83 [2.03, 3.93]	4.87 [3.81, 6.24]	8.78 [6.17, 12.48]
Conduct disorder	6.34 ^a [3.58, 11.22]	6.67 ^a [4.15, 10.74]	17.18 [10.00, 29.50]
Regular smoker	3.81 [2.95, 4.93]	1.68 [1.37, 2.04]	6.45 [4.48, 9.29]
Nicotine dependence	5.03 [3.84, 6.57]	2.49 [1.97, 3.16]	10.32 [7.34, 14.52]
Cannabis use	5.75 [4.29, 7.70]	1.83 [1.51, 2.22]	16.12 [9.50, 27.37]
Other illicit drug use	5.11 [3.91, 6.67]	2.90 [2.29, 3.66]	17.83 [12.41, 25.60]
Suicidality			
Suicide attempt	2.51 [0.28, 22.54]	246.94 ^a [90.52, 673.65]	369.02 ^a [131.83, 1032.97]
Discussed suicide attempt with healthcare professional	2.51 [0.28, 22.54]	134.58 ^a [48.88, 370.04]	149.44 ^a [52.72, 423.61]
Alcohol consumption			
Early onset of drinking, <14 years	1.30 ^{N.S.} [0.99, 1.71]	1.18 ^{N.S.} [0.96, 1.45]	2.03 [1.43, 2.87]
Alcohol treatment	13.10 [7.06, 24.33]	4.95 [2.50, 9.80]	59.53 [33.60, 105.47]
Family history			
Twin suicide attempt	2.06 ^a [1.17, 3.62]	3.52 ^{a,b} [2.37, 5.26]	5.53 ^b [3.21, 9.54]
Parental suicide attempt	2.05 ^{N.S.} [1.22, 3.42]	3.10 [2.10, 4.57]	6.64 [4.14, 10.67]
Twin alcohol problem	1.93 ^a [1.50, 2.48]	1.66 ^a [1.33, 2.07]	3.11 [2.45, 3.95]
Parental alcohol problem	2.22 ^a [1.67, 2.93]	1.74 ^a [1.38, 2.19]	3.36 [2.39, 4.73]

Notes: MZ = monozygotic. ^{N.S.} Estimate not significant at $p < .0028$, with correction for three groups and six domains of covariates, .05 / 18 = .0028. Note that CIs and post hoc tests reflect significance at $p < .05$. Estimates with the same superscripts are not statistically different from each other (tested using post hoc Wald χ^2 tests [$df = 1, p < .05$]). All other estimates are statistically different from each other and from the reference group.

74.5% reported neither AUD nor SI (AUD–SI–), 7.5% were categorized as AUD+SI– (AUD without SI), 13.8% were categorized as AUD–SI+ (SI without AUD), and 4.2% met criteria for AUD and reported SI (AUD+SI+).

Sequence of onsets

The mean age at first SI was 15.9 years ($SD = 4.6$), whereas the mean age at meeting criteria for AUD was 18.2 years ($SD = 2.4$). Comparisons of mean age at SI across the AUD–S+ and AUD+SI+ groups or of AUD across the AUD+SI– and AUD+SI+ groups revealed no significant differences in ages at onset.

Association with covariates

Table 1 reports the means or prevalence of each covariate across the four groups, and Table 2 reports the relative risk

ratios for the AUD–SI+, AUD+SI–, and AUD+SI+ groups, compared with the AUD–SI– group. To facilitate interpretation, we present results in the sections below by covariate type.

Sociodemographics. Relative to the AUD–SI– group, African American ethnicity was overrepresented in the AUD–SI+ group but underrepresented in the AUD+SI– group.

Negative life events. Relative to the other groups, those in the AUD+SI+ group reported elevated rates of exposure to negative life events (with the exception of parental divorce). Childhood physical and sexual abuse were among the most strongly associated, with relative risk ratios of 5.2 and 9.1, respectively, within the AUD+SI+ group compared with the AUD–SI– group. About half of the AUD+SI+ group reported rape or molestation, and 64% of this group reported ever being a victim of assaultive trauma compared with 19.5% in the AUD–SI– group.

Psychopathology and drug use. Across all measures, there was a gradient of increasing association, with highest levels

of psychopathology observed in the AUD+SI+ group. Differences were also noted between the AUD-SI+ and AUD+SI- groups. Among all substance-related covariates, rates were consistently higher in the AUD+SI- versus the AUD-SI+ group, but rates in the AUD-SI+ group were significantly greater than those in the reference AUD-SI- group. In contrast, measures of psychopathology such as major depression, social phobia, and panic attacks were more prominent in the AUD-SI+ group relative to the AUD+SI- group.

Suicidal behavior. Suicide attempts or discussing attempts with a healthcare professional did not vary with the presence or absence of an AUD.

Alcohol consumption. Those in the AUD+SI+ group were more likely to report (a) drinking their first drink before age 15, (b) receiving alcohol treatment, and (c) having a higher maximum number of drinks. For drinking motives, those in the AUD+SI+ group were more likely to report drinking to cope. There also was evidence that, although they scored lower than those with AUD, those in the AUD-SI+ group were drinking to cope more frequently than those in the reference (AUD-SI-) group.

Family history. Respondents in the AUD+SI- group reported rates of co-twin and parental alcohol problems that were similar to those in the AUD-SI+ group. Co-twin suicide attempt was associated with SI regardless of AUD. However, parental suicide attempt was more strongly associated with AUD+SI+ (OR = 6.6) relative to AUD-SI- or to AUD-SI+ (OR = 3.1).

Personality traits. High neuroticism and low extroversion were noted for those reporting SI, regardless of AUD, whereas high impulsivity was associated with AUD, regardless of SI. Those in the AUD+SI+ group reported lower agreeableness and conscientiousness and higher aggression relative to all other groups. No significant differences for openness were noted.

Discussion

The association between suicidal attempts and AUD has been studied frequently; however, few investigations have examined the relationship between SI and AUD, particularly in a female sample. Initial studies largely relied on samples of male alcoholics (e.g., Conner and Chiapella, 2004; Conner et al., 1999), but results from these studies do not necessarily generalize to female populations (Baca-Garcia et al., 2008). For example, when examining both men and women, Connor and colleagues (2003) found that drinking quantity and frequency were associated with SI in those entering treatment for AUD, with both intense and non-intense frequent forms of drinking being important in women. In an independent study of individuals diagnosed with AUD, Connor et al (2007) found that nearly 51% of the sample reported SI. Of particular note, this study found that female gender was a strong predictor of transitions from SI to plan-

ning and attempt in those with AUD. These studies were clinically ascertained; general population samples (e.g., Grant and Hasin, 1999), however, are better suited for studies of comorbidity because they are not limited by treatment referral bias (Caron and Rutter, 1991). However, some of these large-scale studies did not include measures of childhood exposure to abuse, which in a subsequent large-scale longitudinal study of U.S. women was found to prospectively and independently predict SI (Wilsnack et al., 2004). Likewise, childhood exposure to physical abuse and stressful life events (Conner et al., 2012) also has been linked to SI (Kaplan et al., 1999).

In addition to psychopathology, a consistent finding across all groups was the association between rape/molestation, AUD, and SI. In a study of World Mental Health Survey data, of all traumatic events correlated with suicidal behavior (including SI), sexual violence was the most prominent (Stein et al., 2010). This also is consistent with a recent large-scale study of the relationship between gender-based violence and mental health in women. Women who experience even one episode of gender-based violence are at 3.2 and 4.3 increased odds of DSM-IV substance use disorders and of suicide attempts, respectively (Rees et al., 2011). Furthermore, women who experienced even one gender-based violence event were more likely to report poor mental health, greater disability, and significant dissatisfaction with their quality of life. Stressful life events, in general, play an important role in the etiology of AUD and SI (Conner et al., 2012). A study examining thoughts of death/self-harm in a large cohort of females (Fanous et al., 2004), for instance, found that personal negative life events were among the most potent predictors of self-harm. Our study also reinforces the role of sexual abuse as a particularly virulent correlate of AUD with SI in women.

The results of the current study should be viewed with some limitations in mind. First, this is a sample of young adult female twins from Missouri and may not be representative of other cohorts of women. Second, we used self-reported lifetime measures of AUD and SI, which may be subject to recall bias. Third, any lifetime SI was used to define SI, thus selecting for a milder phenotype, a necessity for adequately powered studies in the general population. Nonetheless, the results indicate that even lifetime SI can be a potent influence on mental health.

Although rates of suicide have remained stable (Nock et al., 2008), in some countries (e.g., Iceland), a decline in rates of suicide has paralleled restrictions on alcohol access (Lester, 1999; Wasserman and Värnik, 1998). Comorbidity, however, is a significant barrier to effective treatment for SI and for AUD. Women are a unique population in this regard. They are more likely to seek treatment for SI (Mann et al., 2005; Baca-Garcia et al., 2008) and AUD (Helzer and Pryzbeck, 1988), to seek help for alcohol problems at less severe levels of AUD (Bucholz et al., 1992), and to report abstinent

recovery from alcohol dependence than men (Dawson et al., 2005), making them an ideal population for further concerted treatment efforts. In women, in particular, the need for targeted interventions for AUD that account for SI and for suicidal behavior that account for comorbid AUD may be most beneficial.

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