Transitions to, and Correlates of, Suicidal Ideation, Plans, and Unplanned and Planned Suicide Attempts Among 3,729 Men and Women With Alcohol Dependence*

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ABSTRACT. Objective: Using a heuristic model of suicidal ideation and behavior, the two objectives were to identify correlates of (1) unique suicide-related outcomes (ideation, planning, planned attempt, unplanned attempt) and (2) specific transitions from one suicide-related category to the next. **Method:** Analyses were conducted with data from the Collaborative Study on the Genetics of Alcoholism (COGA), a six-site family pedigree study of individuals in treatment for alcoholism, their relatives, and control families. There were 3,729 subjects in the analysis; all were age 18 years or older with a diagnosis of current alcohol dependence according to the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised. Lifetime suicidal ideation, planning, and attempts were analyzed retrospectively. Correlates of each lifetime transition were analyzed using a series of multivariate logistic regressions. Multivariate multinomial regression analysis was used to examine correlates of each lifetime outcome. **Results:** Female gender is uniquely associated with transitions to unplanned and planned attempts. Independent depression and substance-induced depression are associated with transitions to ideation and planning, whereas alcohol-related aggression is correlated with transitions to unplanned attempts. Analyses of suicide-related outcomes show that women are at higher risk for unplanned and planned attempts. Substance use and impairment are related to suicidal plans and attempts but not ideation. Independent and substance-induced depressions are associated with each suicide-related outcome, whereas alcohol-related aggression is uniquely related to unplanned attempts. **Conclusions:** Data underscore the heterogeneity of suicidal ideation and behavior among alcoholics and indicate the need to make clear distinctions between types of suicidal ideation and behavior in research and prevention efforts. (*J. Stud. Alcohol Drugs* **68:** 654-662, 2007)

ALCOHOL DEPENDENCE IS A POTENT risk factor for suicidal ideation and behavior. A meta-analysis of international studies estimated that individuals with alcohol dependence are at 9.8 (95% confidence interval [CI]: 9.0-10.7) times greater risk for suicide, compared with the general population (Wilcox et al., 2004). U.S. national survey results have reported that alcohol dependence confers a 4.6 (3.5-6.1) times greater risk for suicidal ideation and a 6.5 (3.6-11.5) times greater risk for attempted suicide, compared with individuals without alcohol dependence (Kessler et al., 1999). These data underscore that suicide prevention efforts must focus on alcoholism.

Suicidal behavior is theorized to be the endpoint of a process that is preceded by suicidal ideation and often suicide planning (Joiner, 2005). However, a major gap in the understanding of suicidal behavior among alcoholics is that there has been little progress toward identifying suicide-related correlates at various stages along the pathway from suicidal ideation to overt suicidal behavior. Kessler and colleagues (1999) have provided a heuristic framework for the retrospective examination of individuals who have presumably transitioned from nonideation to suicidal ideation (ideation), ideation to planning (planning), ideation without planning to suicide attempt (unplanned attempt), and planning to attempt (planned attempt). The framework is depicted in Figure 1. Based on this model, analyses of U.S. national surveys have shown that alcohol dependence confers risk for transitions to suicidal ideation and to planning

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in the general population (Kessler et al., 1999), and risk for transitions to suicidal ideation and to unplanned attempt among black Americans (Joe et al., 2006). These data illustrate that individuals with alcohol dependence are at risk for specific transitions along the pathway of suicidal thoughts and behavior but do not speak to variables that may promote specific transitions within the population of alcoholics. In an application of this framework to a study of individuals with alcohol dependence, the first purpose of the current study is to identify specific variables that distinguish alcohol-dependent individuals who have made each type of transition along the proposed pathway of suicidal ideation and attempts. The term *transition* will be used to denote individuals who have presumably made progressions to ideation, to planning, and to unplanned and planned attempts during their lifetime based on retrospective reporting, similar to Joe and colleagues' (2006) examination of *lifetime* transitions.

In addition to providing a strategy to analyze transitions, the framework also yields four unique suicide-related endpoints or outcomes that may be evaluated, including ideation, planning, unplanned attempt, and planned attempt (these outcome groups are depicted in the last column of Figure 1). It has been established that individuals with alcohol dependence are overrepresented across these outcome groups (Kessler et al., 2005), and, unlike the absence of data on predictors of *transitions* among alcoholics, there is a large literature on risk factors for suicide-related *outcomes* in this population. These data support that sociodemographic characteristics—including age (Conner et al., 2003a; Hesselbrock et al., 1988; Preuss et al., 2002a; Roy et al., 1990), gender (Conner et al., 2003a,b; Preuss et al., 2002a; Roy and Janal, 2007; Roy et al., 1990), employment status (Murphy et al., 1992; Preuss et al., 2002a), and marital status (Conner et al., 2003a; Preuss et al., 2002a; Windle, 1994)—are relevant to suicide-related outcomes among alcoholics. Results of these reports suggest that women and younger individuals with alcohol dependence are more likely to attempt suicide, whereas men and older individuals are more likely to die by suicide (Conner et al., 2003a).

Several studies have also shown that severity of substance use and impairment predict suicide-related risk in this population, including indications of heavier drinking (Conner et al., 2003b; Cornelius et al., 1996; Murphy et al., 1992; Roy and Janal, 2007; Roy et al., 1990), greater extent of alcohol-related symptoms and consequences (Murphy et al., 1992; Preuss et al., 2002a), and comorbid drug use and dependence (Hesselbrock et al., 1988; Preuss et al., 2002a; Roy et al., 1990; Windle, 1994). Data also support a role of internalizing psychopathology in promoting suicidal ideation and behavior—including depression (Aharonovich et al., 2002; Conner et al., 2003a,b; Driessen et al., 1998; Murphy et al., 1992; Preuss et al., 2002a; Roy et al., 1990; Windle, 1994) and anxiety disorders (Driessen et al., 1998; Hesselbrock et al., 1988; Roy et al., 1990; Windle, 1994)—as well as externalizing behaviors, including

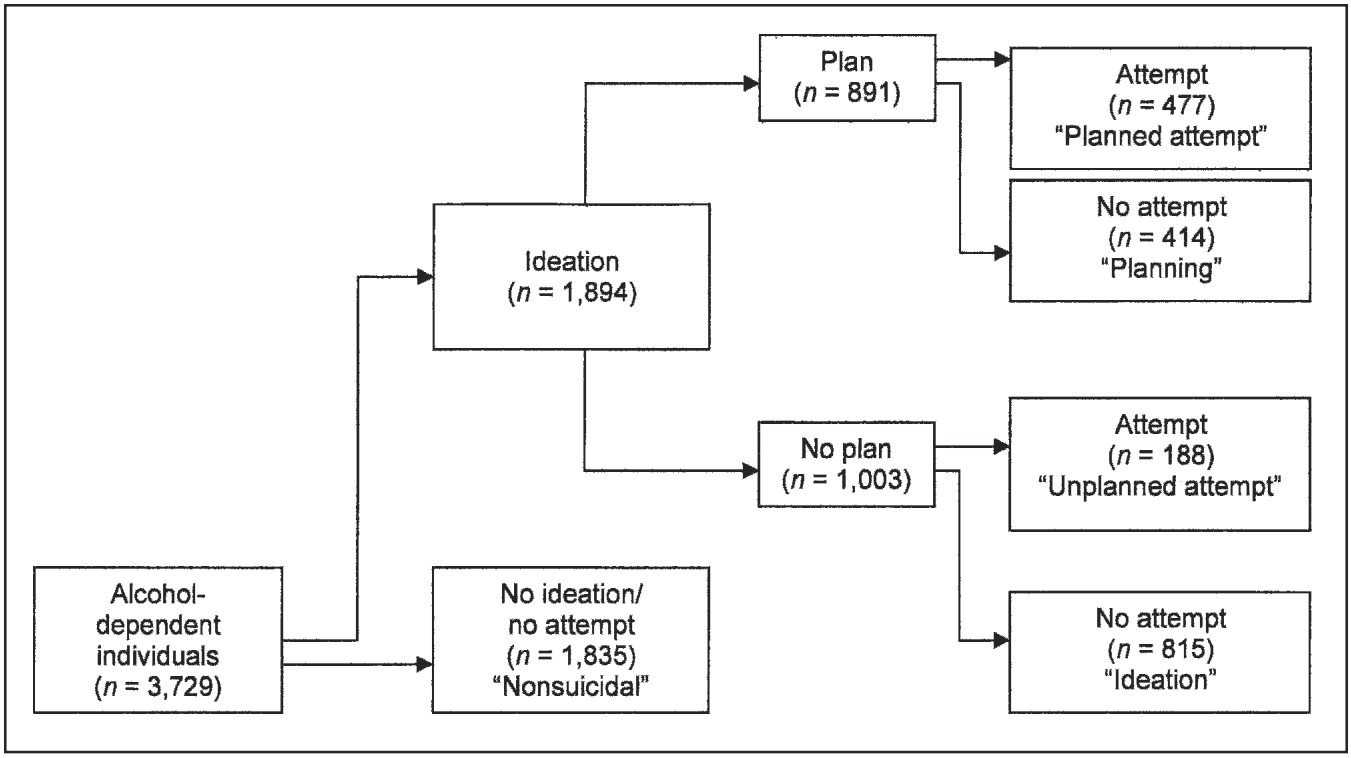

FIGURE 1. Pathways to suicidal ideation, planning, and attempts

antisocial personality features and aggression (Conner et al., 2003b; Preuss et al., 2002a; Roy and Janal, 2007; Roy et al., 1990; Windle, 1994). Findings indicate that depression is associated with both premeditated and impulsive suicide attempts, whereas alcohol-related aggression is uniquely associated with impulsive attempts (Conner et al., 2006).

A limitation of extant data is that, unlike abundant data on suicidal *behaviors,* there are relatively few reports on suicidal *thoughts,* including ideation and plans (Beck et al., 1982; Conner et al., 2003b; Driessen et al., 1998). Moreover, only rarely have studies of alcoholics directly compared correlates of different types of suicidal behaviors (Conner et al., 2003a, 2006). Overall, there are meager data on risk factors across the continuum of suicidal thoughts and behavior. As a result, the extent to which different types of suicidal ideation and behavior share a common risk profile or have different determinants is unclear, with implications for prevention. If predictors vary substantially across outcomes (e.g., if correlates of suicidal thoughts and suicidal behavior differ, or if correlates of unplanned and planned attempts differ), it may suggest the need for targeted strategies to prevent and treat these outcomes. Alternatively, if certain factors are more or less uniform across suicide-related outcomes, it may suggest the value of a singular prevention and treatment strategy. Therefore, a second purpose of this study is to compare correlates across suicide-related outcomes, including suicidal ideation, planning, and unplanned and planned attempts.

We hypothesized that depression, a prevalent condition in alcoholics (Grant et al., 2004) and a potent risk factor for suicidal ideation and behavior in this population (Aharonovich et al., 2002; Conner et al., 2003a,b; Driessen et al., 1998; Murphy et al., 1992; Preuss et al., 2002a; Roy et al., 1990; Windle, 1994), would show the pervasive quality of being associated with each transition and outcome. A previous examination of the Collaborative Study on the Genetics of Alcoholism (COGA) data set showed that alcohol-related aggression was uniquely related to suicide attempts preceded by suicidal ideation lasting less than a week, and the brief period of ideation suggests that they were unplanned attempts (Conner et al., 2006). Accordingly, in the current study, we hypothesized that alcohol-related aggression would be associated with unplanned attempts and with the transition to unplanned attempts. There are meager data in alcoholics on which to base other specific hypotheses.

Method

Data were extracted from COGA, a six-site family pedigree study of adults in treatment for alcoholism (probands), their relatives, as well as control families recruited through a variety of methods (e.g., drivers' license records). Data were gathered using the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA; Bucholz et al., 1994, 2000; Hesselbrock et al., 1999). SSAGA assesses 17 mental disorders (American Psychiatric Association, 1987) plus antisocial personality disorder and includes extensive substance and mood sections that distinguish "substance-induced" depressive episodes from "independent" episodes that occurred before the onset of alcoholism or during a period of abstinence of 3 months or more (Schuckit et al., 1997).

For the present investigation, subjects ages 18 and older with current alcohol dependence—as defined by the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R; American Psychiatric Association, 1987), regardless of proband status—were included (n = 3,781). Fifty-seven (1.5%) subjects were excluded from analyses because of missing data, and 18 (0.5%) subjects were excluded because of a rare report of a history of suicide attempt but no ideation (a figure too small for analyses), yielding a sample of 3,729. Descriptive data on gender, race/ethnicity, and age are as follows: female (1,314, 35.2%); white (2,801, 75.1%), black (598, 16.0%), white Hispanic (180, 4.8%), black Hispanic (39, 1.1%), other race/ethnicity (59, 1.6%), missing race/ethnicity (52, 1.4%); age 18-24 (395, 10.6%), age 25-34 (1,303, 34.9%), age 35-44 (1,109, 29.7%), and age 45 or older (922, 24.7%).

To assess suicidal ideation (present/absent), all subjects were asked, "Have you ever thought about killing yourself?" To determine a plan (present/absent), subjects endorsing ideation were asked, "Did you have a plan?" To assess suicide attempt (present/absent), all subjects were asked, "Have you ever tried to kill yourself?" Based on these suicide attempt and ideation questions, we applied Kessler and colleagues' (1999) heuristic model of suicidal ideation and behavior to generate Figure 1. As shown in the figure, each node distinguishes subjects in the current investigation who, across their lifetime, have presumably progressed from one state (e.g., suicidal ideation) to another (e.g., planning) along a hypothesized pathway of suicidal ideation and behavior. The right column in Figure 1 also shows four unique suicide-related outcome groups. The figure also depicts a group of individuals with no history of ideation or attempts, conceptualized as being at low risk.

Specific independent variables are as follows: sociodemographic factors (gender, age, employment status, marital status); substance use and impairment, including drinking (age of onset of regular drinking, maximum number of drinks in 24 hours), alcohol-related symptoms (number of alcohol-dependence criteria, number of alcohol-related physical problems), and drug use (number of illicit substances dependent on); internalizing behaviors (depressive disorders, anxiety disorders); and externalizing behaviors (antisocial personality disorder, alcohol-related aggression). Proband status was also included because of its relevance to sampling. The following continuous measures were

categorized because of highly skewed distributions: age of onset of regular drinking, maximum number of drinks in 24 hours, number of alcohol-related physical problems, and number of illicit substances dependent on.

Depression includes any history of independent depression (present/absent) and any history of substance-induced depression (present/absent). Independent depression, substance-induced depression, and no depressive episodes are mutually exclusive categories; subjects who experienced both types of depression in their lifetime are categorized as independent. Anxiety disorder (present/absent) includes any history of panic disorder, social phobia, agoraphobia, or obsessive-compulsive disorder, whether substance induced or independent of alcohol. Depressive disorders and anxiety disorders require meeting full DSM-III-R diagnostic criteria with the exception that substance-induced disorders may occur in the context of ongoing substance use and/or withdrawal. The alcohol-related aggression measure was comprised of five questions with a range of 0 to 5 (α = .71). The questions assessed if each of the following occurred three or more times while drinking: (1) argued with others, (2) hit things or threw something, (3) hit a significant other or family member, (4) hit anyone else without getting into a fight, and (5) physically fought someone. COGA uses procedures to distinguish substance-related symptoms of antisocial personality disorder (Bucholz et al., 1994, 2000; Hesselbrock et al., 1999). To sharpen the distinction with alcohol-related aggression, childhood and adult misbehaviors attributed exclusively to alcohol or other substance use were not considered when making a diagnosis of antisocial personality disorder or in these analyses. In other words, each symptom was considered to meet criteria only if it was determined to occur apart from substance use.

Data analytic strategy

Analyses of suicide-related transitions were based on a series of four multivariate logistic regression analyses (Hosmer and Lemeshow, 2000): (1) ideation: individuals with a history of ideation (n = 1,894) were compared with those with no ideation (n = 1,835); (2) planning: conditioned on having a history of ideation, subjects with a history of planning (n = 891) were compared with those without planning (n = 1,003); (3) planned attempt: conditioned on having a history of planning, subjects with an attempt (n = 477) were compared with those without an attempt (n = 414); and (4) unplanned attempt: conditioned on having a history of ideation but no history of planning, subjects with an attempt (n = 188) were compared with those without an attempt (n = 815). The analysis of suicide-related outcomes was based on a multivariate multinomial logistic regression (Hosmer and Lemeshow, 2000) analysis that simultaneously compared each outcome group (ideation [n = 815], planning [n = 414], unplanned attempt [n = 188], and planned attempt [n = 477]) with individuals with no history of ideation or attempts that served as a low-risk reference group (n = 1,835). Because depression and anxiety disorders are conceptually related as internalizing variables and may show collinearity, we re-ran the multinomial model without the depressive disorders to determine the effects on results pertaining to anxiety disorder and re-ran the model without anxiety disorder to determine the effects on the results pertaining to depressive disorders. We repeated this procedure to examine potential collinearity of antisocial personality disorder and alcohol-related aggression (externalizing variables).

All correlates were forced simultaneously into the models; therefore, each correlate was adjusted for all other variables. To promote comparability among models, the same set of correlates was included in each model. The sampling allowed multiple members from the same family to be selected. Mean (SD) family size in the analysis was 2.6 (1.9), with a range from 1 to 17. To adjust estimates for nonindependence of observations, robust standard errors adjusted for clustering of subjects within family were calculated using STATA version 8.2 (StataCorp LP, College Station, TX). This analytic technique assumes that observations are independent between clusters (families) but not necessarily within them. Goodness of fit was analyzed using the Hosmer-Lemeshow statistic (Hosmer and Lemeshow, 2000). For multinomial analysis, fit statistics are based on a series of multivariate logistic regression comparisons of each suicide-related outcome group to low-risk subjects. Odds ratios (ORs) and 95% CIs were derived using the method of maximum likelihood, and CIs that did not include 1.0 were interpreted to be statistically significant (Hosmer and Lemeshow, 2000).

Results

Analyses of transitions

As calculated based on Figure 1, the probability (n, %) of having made a transition at each node is as follows: to suicidal ideation (n = 1,894, 50.8%), to planning (n = 891, 47.0%), to planned attempt (n = 477, 53.5%), and to unplanned attempt (n = 188, 18.7%). Results of the transition analyses are presented in Table 1. Each model shows adequate fit: suicidal ideation (χ^2 = 10.2, 8 df, p = .25); planning (χ^2 = 11.1, 8 df, p = .20); planned attempt (χ^2 = 4.2, 8 df, p = .84); and unplanned attempt (χ^2 = 2.6, 8 df, p = .96). Based on R^2, these models account for 13.8% (ideation), 5.7% (planning), 8.2% (planned attempt), and 13.9% (unplanned attempt) of the variance.

Suicidal ideation and behavior were significantly associated with female gender, internalizing behaviors, and alcohol-related aggression. However, each of these factors

TABLE 1. Separate multivariate logistic regression analyses of transitions from nonsuicidal to ideation, ideation to planning, planning to planned attempt, and ideation to unplanned attempt

		Ideation	Planning	Planned attempt	Unplanned attempt
Correlate	Strata	Among all subjects: Ideation (1,894) vs nonsuicidal (1,835) OR (95% CI)	Among subjects with ideation: Planning (891) vs no planning (1,003) OR (95% CI)	Among subjects with ideation plus planning: Attempt (477) vs no attempt (414) OR (95% CI)	Among subjects with ideation but no planning: Attempt (188) vs no attempt (815) OR (95% CI)
Sociodemographics					
Gender	Female	1.7 (1.5-2.1)	1.2 (1.0-1.5)	3.4 (2.4-4.9)	3.8 (2.5-5.7)
	Male	1.0	1.0	1.0	1.0
Age	18-24	1.3 (0.9-1.7)	1.1 (0.7-1.7)	1.7 (1.0-3.1)	0.6 (0.3-1.2)
	25-34	1.0 (0.8-1.3)	0.9 (0.7-1.2)	1.4 (0.9-2.2)	0.6 (0.3-1.0)
	35-44	1.0 (0.8-1.3)	0.8 (0.6-1.1)	1.2 (0.8-1.9)	0.6 (0.3-0.9)
	≥45	1.0	1.0	1.0	1.0
Employment status	Not employed	0.8 (0.7-0.9)	1.2 (0.9-1.4)	1.3 (1.0-1.8)	1.5 (1.0-2.2)
	Employed	1.0	1.0	1.0	1.0
Marital status	Separated/divorced	1.2 (1.0-1.4)	1.1 (0.9-1.4)	1.1 (0.8-1.5)	0.9 (0.6-1.4)
	Married/single/ widowed	1.0	1.0	1.0	1.0
Substance use/impairment					
Age onset of regular drinking, years	≤12	1.8 (1.2-2.6)	0.8 (0.9-1.4)	1.1 (0.6-2.0)	1.9 (0.9-4.1)
	13-16	1.3 (1.1-1.7)	0.8 (0.5-1.2)	1.0 (0.7-1.6)	1.1 (0.6-1.9)
	17-20	1.1 (0.9-1.4)	0.8 (0.6-1.0)	1.1 (0.7-1.7)	0.9 (0.5-1.7)
	≥21	1.0	1.0	1.0	1.0
Maximum no. drinks in 24 hours, quartiles	≤14	1.0	1.0	1.0	1.0
	15-23	1.2 (0.9-1.5)	1.1 (0.8-1.5)	1.4 (0.9-2.2)	1.1 (0.6-2.1)
	24-35	1.1 (0.9-1.4)	1.0 (0.7-1.3)	1.3 (0.8-2.1)	1.9 (1.0-3.4)
	≥36	1.1 (0.9-1.4)	1.3 (0.9-1.9)	1.8 (1.0-3.0)	2.0 (1.0-4.1)
Alcohol dependence symptoms, 3-9[a]		1.10 (1.05-1.15)	1.00 (0.93-1.07)	0.96 (0.87-1.05)	1.05 (0.92-1.20)
No. alcohol-related physical problems	0	1.0	1.0	1.0	1.0
	1	1.1 (0.9-1.4)	1.3 (1.0-1.7)	1.9 (1.3-2.8)	1.5 (0.9-2.4)
	≥2	1.1 (0.8-1.5)	1.6 (1.1-2.3)	2.0 (1.3-3.2)	1.7 (0.9-3.2)
No. illicit substances dependent on	0	1.0	1.0	1.0	1.0
	1	1.4 (1.1-1.6)	1.5 (1.2-2.0)	1.3 (0.9-1.9)	1.5 (1.0-2.4)
	≥2	1.5 (1.2-1.8)	1.5 (1.1-1.9)	1.3 (0.9-1.9)	0.9 (0.6-1.6)
Internalizing behaviors					
History of depression	No history	1.0	1.0	1.0	1.0
	Substance induced	2.5 (2.2-3.0)	1.7 (1.3-2.1)	1.3 (0.9-1.9)	1.3 (0.8-1.9)
	Independent	4.0 (3.2-5.0)	1.9 (1.4-2.4)	1.3 (0.9-1.9)	1.7 (1.1-2.6)
Anxiety disorder	No history	1.0	1.0	1.0	1.0
	Any history	1.9 (1.5-2.4)	1.6 (1.3-2.1)	1.1 (0.7-1.5)	0.8 (0.5-1.3)
Externalizing behaviors					
Antisociality	Not ASPD	1.0	1.0	1.0	1.0
	ASPD	1.3 (1.0-1.6)	1.2 (0.9-1.6)	1.2 (0.8-1.7)	1.1 (0.7-0.8)
Alcohol-related aggression score, 0-5[a]		1.09 (1.03-1.15)	1.01 (0.94-1.08)	1.08 (0.97-1.20)	1.34 (1.16-1.56)
Proband status	Not proband	1.0	1.0	1.0	1.0
	Proband	1.0 (0.9-1.2)	1.1 (0.8-1.3)	1.2 (0.8-1.7)	1.2 (0.8-1.7)

Notes: OR = odds ratio; CI = confidence interval; ASPD = antisocial personality disorder. [a]Continuous variable.

uniquely predicted different aspects of the suicide-risk pathway. Specifically, female gender (OR [95% CI]) is strongly associated with transitions to suicidal behavior, including to planned attempt (3.4 [2.4-4.9]) and to unplanned attempt (3.8 [2.5-5.7]), but shows a reduced association with transitions to suicidal thoughts, including to suicidal ideation (1.7 [1.5-2.1]) and to planning (1.2 [1.0-1.5]). In contrast to the pattern of results for gender, findings support a role of internalizing disorders (depression, anxiety) in promoting transitions to suicidal ideation and planning but a reduced role (or no role) in promoting transitions to unplanned and planned attempts. More specifically, depression (OR [95% CI]) discriminates transitions to ideation (substance-induced depression = 2.5 [2.2-3.0] and independent depression = 4.0 [3.2-5.0]), and planning (substance-induced depression = 1.7 [1.3-2.1] and independent depression = 1.9 [1.4-2.4]). In contrast, neither depression variable is significantly associated with a transition to planned attempt, and only independent depression is associated with a transition to unplanned attempt (1.7 [1.1-2.6]). Anxiety disorders are associated with transitions to suicidal ideation (1.9 [1.5-2.4]) and planning (1.6 [1.3-2.1]) but do not show a statistically significant association with transitions to either type of attempt. Other findings indicate that alcohol-related aggression shows an association with transition to unplanned attempt (1.34 [1.16-1.56)]. The OR (CIs) may be interpreted

to indicate that each one-unit increase on this five-item aggression scale is associated with a 34% (16%-56%) greater likelihood of transition to unplanned suicide attempt, suggesting a strong association. In contrast, other associations of alcohol-related aggression and transitions were either weaker (to ideation = 1.09 [1.03-1.15]) or statistically nonsignificant.

Analysis of outcomes

Results of the multinomial analysis are shown in Table 2. Based on R^2, the model accounts for 10.9% of the variance. Model fit is adequate: suicidal ideation (χ^2 = 13.9, 8 df, p = .08), planning (χ^2 = 6.6, 8 df, p = .58), planned attempt (χ^2 = 9.6, 8 df, p = .30), and unplanned attempt (χ^2 = 4.8, 8 df, p = .78). The pattern of results pertaining to female gender in the transition analyses was also borne out in the analysis of suicide-related outcomes. Specifically, after accounting for covariates, women (OR [95% CI]) show a 3.4 (2.5-4.5) times greater likelihood of a planned attempt and a 4.8 (3.3-6.9) greater odds for an unplanned attempt compared with men, but the results do not support that women are at elevated risk for suicidal ideation or planning. In contrast to the pattern of results for transition analyses, internalizing disorders are associated with each suicide-related outcome, with the lone exception of a nonsignificant association of anxiety disorders and unplanned attempts. Similar to the results of the transition analysis,

TABLE 2. Multivariate multinomial regression comparison of each suicide outcome group to nonsuicidal subjects

		Ideation	Planning	Planned attempt	Unplanned attempt
Correlate	Strata	Ideation only (815) vs nonsuicidal (1,835) OR (95% CI)	Ideation & plan (414) vs nonsuicidal (1,835) OR (95% CI)	Ideation & plan & attempt (477) vs nonsuicidal (1,835) OR (95% CI)	Ideation & attempt (188) vs nonsuicidal (1,835) OR (95% CI)
Sociodemographics					
Gender	Female	1.3 (1.1-1.6)	1.1 (0.9-1.5)	3.4 (2.5-4.5)	4.8 (3.3-6.9)
	Male	1.0	1.0	1.0	1.0
Age	18-24	1.3 (0.9-1.8)	1.1 (0.7-1.7)	1.6 (1.0-2.6)	0.8 (0.4-1.6)
	25-34	1.2 (0.9-1.6)	0.9 (0.6-1.2)	1.1 (0.8-1.6)	0.7 (0.4-1.1)
	35-44	1.3 (1.0-1.6)	0.8 (0.6-1.1)	1.0 (0.7-1.4)	0.7 (0.4-1.0)
	≥45	1.0	1.0	1.0	1.0
Employment status	Not employed	0.7 (0.6-0.8)	0.8 (0.6-1.0)	1.0 (0.8-1.3)	1.1 (0.8-1.6)
	Employed	1.0	1.0	1.0	1.0
Marital status	Separated/divorced	1.2 (0.9-1.4)	1.3 (1.0-1.6)	1.3 (1.0-1.7)	1.1 (0.8-1.6)
	Married/single/ widowed	1.0	1.0	1.0	1.0
Substance use/impairment					
Age onset of regular drinking, years	≤12	1.7 (1.1-2.7)	1.5 (0.9-2.6)	1.7 (1.0-2.9)	3.2 (1.6-6.6)
	13-16	1.5 (1.1-2.0)	1.1 (0.8-1.7)	1.2 (0.8-1.7)	1.8 (1.1-2.9)
	17-20	1.2 (0.9-1.6)	1.0 (0.7-1.4)	1.0 (0.7-1.4)	1.3 (0.8-2.3)
	≥21	1.0	1.0	1.0	1.0
Maximum no. drinks in 24 hours, quartiles	≤14	1.0	1.0	1.0	1.0
	15-23	1.1 (0.8-1.4)	1.1 (0.7-1.5)	1.4 (1.0-2.0)	1.1 (0.6-2.0)
	24-35	1.0 (0.8-1.3)	1.0 (0.7-1.5)	1.3 (0.9-1.9)	1.8 (1.0-3.2)
	≥36	0.9 (0.7-1.2)	1.0 (0.7-1.5)	1.8 (1.2-2.7)	1.5 (0.8-3.0)
Alcohol-dependence symptoms,	3-9[a]	1.10 (1.04-1.17)	1.11 (1.03-1.20)	1.07 (0.99-1.16)	1.12 (1.00-1.26)
No. alcohol-related physical problems	0	1.0	1.0	1.0	1.0
	1	0.9 (0.7-1.2)	1.0 (0.7-1.4)	1.7 (1.3-2.4)	1.5 (1.0-2.4)
	≥2	0.7 (0.5-1.0)	1.0 (0.7-1.6)	1.8 (1.2-2.7)	1.4 (0.8-2.4)
No. illicit substances dependent on	0	1.0	1.0	1.0	1.0
	1	1.1 (0.8-1.4)	1.6 (1.2-2.2)	1.9 (1.4-2.6)	1.6 (1.1-2.5)
	≥2	1.3 (1.0-1.6)	1.8 (1.3-2.4)	2.1 (1.5-2.9)	1.3 (0.8-2.1)
Internalizing behaviors					
History of depression	No history	1.0	1.0	1.0	1.0
	Substance induced	1.9 (1.6-2.4)	3.1 (2.4-4.1)	3.9 (2.9-5.1)	2.5 (1.7-3.6)
	Independent	2.8 (2.2-3.7)	5.3 (3.8-7.3)	6.7 (4.8-9.3)	4.6 (3.0-7.1)
Anxiety disorder	No history	1.0	1.0	1.0	1.0
	Any history	1.5 (1.1-2.0)	2.3 (1.6-3.1)	2.4 (1.8-3.4)	1.3 (0.8-2.0)
Externalizing behaviors					
Antisociality	Not ASPD	1.0	1.0	1.0	1.0
	ASPD	1.2 (0.9-1.5)	1.4 (1.0-1.9)	1.5 (1.1-2.1)	1.4 (0.9-2.2)
Alcohol-related aggression score, 0-5[a]		1.04 (0.98-1.12)	1.06 (0.98-1.16)	1.12 (1.03-1.22)	1.37 (1.20-1.56)
Proband status	Not proband	1.0	1.0	1.0	1.0
	Proband	1.0 (0.8-1.2)	1.0 (0.8-1.3)	1.1 (0.9-1.5)	1.2 (0.8-1.7)

Notes: OR = odds ratio; CI = confidence interval; ASPD = antisocial personality disorder. [a]Continuous variable.

alcohol-related aggression shows a strong association with a history of unplanned suicide attempts (1.37 [1.20-1.56]). It also shows a lesser association with planned suicide attempt (1.12 [1.03-1.22]). Results of the outcome analysis support that indications of more severe substance use and impairment (age of onset of regular drinking before age 12, maximum of ≥36 drinks in 24 hours, alcohol dependence symptom count, alcohol-related physical problems, number of illicit drug dependencies) are associated, at a statistically significant level or trend level, with a range of suicide-related outcomes. Moreover, with one exception (alcohol dependence symptom count), measures of substance use and impairment are more predictive of more severe suicide-related outcomes (planning, unplanned attempts, planned attempts) compared with suicidal ideation. Finally, in the follow-up analyses that examined potential collinearity of internalizing and externalizing variables, in all instances the effects of the re-analysis on the point estimates and CIs were modest, and the pattern of results was unchanged.

Discussion

Approximately half of the sample had a history of suicidal ideation, illustrating the ubiquitous nature of suicidal thoughts among those with alcohol dependence. Nearly all suicide attempters had a history of suicidal ideation, suggesting the value of focusing suicide prevention efforts on the subpopulation of alcoholics who have experienced suicidal ideation. Data show heightened probability of transitioning to a suicide attempt among individuals with ideation who have also formulated a plan, consistent with the results of national representative surveys in the United States (Kessler et al., 1999, 2005). Planned suicide attempts tend to be more medically serious than nonplanned attempts (Haw et al., 2003; Oquendo et al., 2003) and confer greater risk for eventual death by suicide (Harriss et al., 2005). These data illustrate the critical importance of targeting suicide planning in efforts to prevent attempted suicide and suicide.

Additionally, results show that female gender is strongly associated with planned and unplanned attempts and transitions to such attempts but shows minimal or no associations with measures of suicidal thoughts. These data suggest heightened suicidal action proneness among alcohol-dependent women that may help explain their elevated risk for suicide attempts (Preuss et al., 2002a). Comparing the current findings with Kessler and colleagues' (1999) analyses from the National Comordity Survey (NCS), associations of female gender with transitions to suicidal ideation and suicide planning are comparable (OR [95% CI]): ideation = 1.7 [1.2-2.4]; planning = 1.2 [0.3-5.2]), whereas female gender shows a higher association with transitions to unplanned and planned attempts in the current sample, compared with the NCS results (unplanned attempt = 1.5 [1.1-2.0]); planned attempt = 1.8 [1.1-2.3]). Our analyses suggest that, among individuals with alcohol dependence, women may be at especially high risk for suicidal attempts.

Although generalization of the current results to suicide deaths is unclear, alcohol-dependent women are also at risk for suicide as illustrated by a meta-analysis that estimated a 16.9 (12.5-22.4) greater risk, compared with women residing in the general population (Wilcox et al., 2004). These findings underscore that suicidal behaviors among alcohol-dependent women can be deadly and that accelerated prevention efforts for this group are urgently needed. Overall, results of the current study suggest that efforts to prevent suicidal behavior tailored to alcohol-dependent women should not merely focus on drinking, depressed moods, and suicidal thoughts but should also include an explicit focus on reducing their propensity to make a suicide attempt when ideation or planning occurs. More research on heightened suicidal action proneness among female alcoholics is essential to inform prevention and intervention efforts.

Results of the outcome analysis show that, among individuals with alcohol dependence, depressive disorders and, to a lesser extent, anxiety disorders distinguish individuals who have experienced a range of suicidal thoughts (ideation, plans) as well as behaviors (unplanned attempts, planned attempts). These data support the value of targeting internalizing disorders in the design of suicide risk recognition and treatment strategies for those with alcohol dependence. Results of the transitions analyses further suggest that the role of internalizing disorders in promoting risk is primarily attributable to their influence on suicidal ideation and plans rather than being a key promoter of transitions to suicide attempts. One implication of these results is that preventing or effectively treating internalizing disorders, particularly depressive disorders, may reduce risk for suicidal behavior broadly in this population insofar as depressive disorders are a potent risk factor for suicidal behavior, are prevalent among individuals with alcohol dependence, and are most relevant at early transition points in the pathway to suicidal behavior.

Results support that alcohol-related aggression is most strongly associated with unplanned suicide attempts, consistent with the results of a prior analysis of the COGA data set (Conner et al., 2006). Potential explanations for the findings include that the measure of alcohol-related aggression is measuring a proneness to disinhibited anger during drinking bouts and/or is tapping the reactive subtype of aggression, which, in turn, have been hypothesized to promote unplanned suicide attempts (Conner et al., 2006; Mayfield and Montgomery, 1972). Assessing the propensity for aggression both with and without alcohol use/intoxication could shed light on this distinction. Interestingly, the alcohol-related aggression score showed a modest association with a history of planned attempts (OR [95% CI] =

1.12 [1.03-1.22]) and in the transition analysis the association approached statistical significance (1.08 [0.97-1.20]), suggesting that alcohol-related aggression may also play some role in planned suicide attempts.

Considering major depression and antisocial personality disorder, Kessler and colleagues (1999) showed that transitions to suicidal ideation are more strongly associated with these disorders (major depression = 10.7 [8.4-13.5]; antisocial personality disorder = 4.6 [3.2-6.5]), compared with the current analyses. These data suggest that these disorders are not as predictive of suicidal ideation among individuals with alcohol dependence as they are in the general population. Finally, in the outcome analysis, substance use and impairment were generally associated with severe forms of suicidality (planning, attempts) but not suicidal ideation. Suicidal ideation is ubiquitous among alcoholics and is a relatively nonspecific risk factor for suicidal behavior that may help explain why it is seen across a full range of substance use and impairment. In other words, measures of substance use and impairment may be poorly predictive of suicidal ideation because it is a relatively prevalent and less severe outcome.

There are limitations of the study. Simple categorical lifetime assessments of suicidal ideation, planning, and attempts were examined. Causal inferences cannot be made in light of the retrospective nature of the data. Our analyses do not provide direct insights into the mechanism(s) by which correlates are associated with the outcomes. Variables that are associated with or that statistically "predict" differences between groups in transition analyses are not equivalent to the direct examination of transitions from one suicide-related state to the next. Such an examination would require a prospective design. The models account for a modest amount of variance. The extent to which a history of engaging in suicide planning is tapping the level of planning associated with a specific suicide attempt is unclear. Suicidal ideation and behavior are symptoms of depression that may bias estimates concerning depression and the suicide-related transitions and outcomes. Although numerous correlates of suicidal ideation and behavior relevant to alcoholics were examined, the list was not exhaustive (e.g., data on hopelessness were not available—a potentially important correlate) (Beck et al., 1976, 1982). Comparisons of results with national data based on the NCS report (Kessler et al., 1999) are interpreted with caution in light of differences in sampling, time frame (lifetime vs past year), measures, and covariate coverage.

There are also many strengths of the study. Assets of the COGA data set include a large sample of women; use of a reliable and detailed semistructured assessment protocol tailored to alcoholism; rigorous assessments of depression, anxiety, and antisocial personality disorders; and several questions about suicidal behavior—creating a unique opportunity to examine suicidal ideation, planning, and attempts in this population. This is the first published report to use Kessler and colleagues' (1999) heuristic model of suicidal-ideation and behavior in a large sample of individuals with alcoholism. Although a wealth of data on correlates of suicide-related outcomes among alcoholics is available (Conner et al., 2006; Preuss et al., 2002a,b, 2003), this was the first analysis of COGA and, as far as we are able to determine, any other published report on alcoholism to compare simultaneous correlates of numerous types of suicidal thoughts *and* behaviors. Finally, the creation of a low-risk comparison group is challenging in the study of alcoholics for which rates of suicidal ideation and planning not accompanied by an attempt are high. A novel feature of the current study is that such subjects were excluded from the reference group, creating a more definitively low-risk comparison group of nonsuicidal individuals.

The results illustrate the complexity of suicidal thoughts and behavior among individuals with alcoholism, suggesting that few variables may be predictive across the continuum of suicidal ideation and attempts, and affirm the need for the use of clearly defined outcomes and specific transitions in suicide research studies. Although results should be interpreted cautiously in light of the retrospective study design, definitive data based on prospective studies are unlikely to be forthcoming anytime soon given the low base rate of suicide attempts that may be anticipated in prospective research on alcoholics (Preuss et al., 2003). As a result, it is important to make maximum use of existing data sets, such as COGA. There is also the need to implement large prospective studies with refined measures of suicidal ideation and planning to examine systematically suicide-related transitions with relatively higher base rates.

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