Published in final edited form as:

Addict Behav. 2010 February ; 35(2): 152–156. doi:10.1016/j.addbeh.2009.09.020.

Alcohol use disorders and acute alcohol use preceding suicide in China

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Abstract

Objectives—Identify distinguishing characteristics of subgroups of suicides classified according to different patterns of alcohol use prior to death.

Methods—Three groups of suicide decedents from a representative sample of 454 male suicides in China identified in a national psychological autopsy study were classified and compared: decedents with an alcohol use disorder during the year prior to death, those without an alcohol use disorder who used alcohol acutely at the time of suicide, and those with neither an alcohol use disorder nor acute use.

Results—Compared with suicides unrelated to alcohol, those with an alcohol use disorder were more likely to have made previous suicide attempts (adjusted OR, 95%CI=1.94, 1.07–3.53), and suicides with acute alcohol use were less likely to have poor overall functioning in the month before death (0.36, 0.20–0.63).

Conclusions—The characteristics of male suicide decedents with an alcohol use disorder, using alcohol acutely but without an alcohol use disorder, and with no alcohol involvement are somewhat different, suggesting the potential value of tailored prevention strategies.

Keywords

Suicide; Alcoholism; Acute alcoholic intoxication; China

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Contributors

K.R. Conner and M.R. Phillips designed this secondary analysis. Y. Zhang conducted the statistical analysis. Y. Zhang wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of Interest

None.

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1. Introduction

Systematic reviews indicate that alcohol use disorders confer risk for suicide (Cavanagh, Carson, Sharpe, & Lawrie, 2003; Wilcox, Conner, & Caine, 2004). Indeed, alcohol use disorders are the second most common Axis I psychiatric disorder among suicides worldwide, second only to major depression (Cavanagh, Carson, Sharpe, & Lawrie, 2003). Male gender, younger age, divorce, unemployment, more recent negative life events, prior suicide attempts, a lower prevalence of major depression (and other Axis I psychiatric disorders), and less prior psychiatric treatment differentiate suicides with alcohol use disorders from those without an alcohol use disorder (Heikkinen et al., 1994; Pirkola, Isometsa, Heikkinen, & Lonnqvist, 2000). The findings pertaining to a lower prevalence of major depression and other Axis I psychiatric disorders among suicides with alcohol use disorders suggests that the throes of active alcoholism in combination with other life difficulties (e.g., acute stressful events) may lead to suicide even among individuals who are not experiencing other major psychiatric conditions.

Review of studies containing data on the acute use of alcohol at the time of suicide conclude that an average of 37% (range 10% to 69%) of suicide decedents had been drinking at the time of death (Cherpitel, Borges, & Wilcox, 2004). Acute alcohol use confers risk for suicidal behavior even after accounting for alcohol use disorders, indicating that acute alcohol use at the time of suicide is not merely a reflection of ongoing drinking problems (Borges & Rosovsky, 1996). Compared with suicide decedents who did not use alcohol prior to suicide, those who consumed alcohol acutely prior to suicide are more likely to be male, younger, divorced, unemployed, to have experienced recent negative life events and to have received less prior psychiatric treatment, but they do not have elevated rates of prior suicide attempts (Crombie, Pounder, & Dick, 1998; Hayward, Zubrick, & Silburn, 1992; Welte, Abel, & Wieczorek, 1988). However, studies that compare characteristics of persons with and without acute alcohol use prior to suicide are difficult to interpret because both groups include an unspecified proportion of individuals with a current alcohol use disorder.

These data are based on Western samples, so their relevance to China—where an estimated 31% of all global suicides occur (World Health Organization, 2004)—is unclear. Indeed, a large, nationally representative case-control psychological autopsy study of suicide conducted in China in 1995–2000 (Phillips et al., 2002) found that the prevalence of alcohol abuse and dependence in suicide decedents (8%) was not significantly higher than in the accidental death control subjects (7%) suggesting that alcohol use disorders may not be an independent risk factor for suicide in China. However, the higher rates of alcohol use disorders among those who die by accidents than in the general population may have obscured their role in suicide. Given the dramatic increase in alcohol consumption and alcohol use disorders among males in China in recent years (Hao et al., 2004; Phillips et al., 2009), a re-examination of the relationship of alcohol use and alcohol use disorders to suicide in China is warranted. Finally, the disparity between men and women in alcohol use disorders in China compared with the U.S. and other Western countries is much more pronounced, for example a report showing a 48-fold greater prevalence in men than in women, attributable to the very low prevalence of alcohol use disorders among women in China (Phillips et al., 2009). As a result, any increased role of drinking and alcohol use disorders in suicides is presumed to be concentrated in men who are the focus of this report.

1.1. Aims of the study

This secondary analysis of China's National Psychological Autopsy Study, focuses on the 454 male suicides identified in the study; the 441 female suicides were excluded because only 4 (0.9%) of them met diagnostic criteria for an alcohol use disorder and only 24 (5.4%) used alcohol acutely before suicide, providing too few subjects for analysis. These low rates of

alcohol use in female suicide decedents are consistent with the very low prevalence of alcohol use disorders reported among females in the general Chinese population (Hao et al., 2004; Phillips et al., 2009).

Our aim was to compare the characteristics of three distinct groups of male suicide decedents: 1) those who met DSM-IV (American Psychiatric Association, 1994) criteria of an alcohol use disorder—either alcohol abuse or alcohol dependence—over the year prior to death (the alcohol use disorder group), 2) those who consumed alcohol at the time of suicide but did not have an alcohol use disorder (the acute alcohol use group), and 3) those who had neither acute alcohol use nor an alcohol use disorder (the non-alcohol group). We compare these groups on a variety of domains relevant to suicide including comorbid major depression, prior suicide attempts, overall functioning, stressful life events, chronic stress due to negative life events, and socio-demographic characteristics. Based on available (largely Western) literature, we hypothesize that among the three groups of male suicide decedents, 1) the non-alcohol group are more likely to meet diagnostic criteria for major depression than the other two study groups, and 2) the alcohol use disorder group are more likely to have had a prior suicide attempt than the other two groups. To our knowledge this is the first postmortem study to make these comparisons using a Chinese sample and the first from any country to compare three non-overlapping groups of suicide decedents: those unrelated to alcohol use, those with alcohol use disorders, and those with acute use of alcohol prior to the suicide in the absence of an alcohol use disorder.

2. Material and methods

2.1. Subjects

The National Psychological Autopsy Study (Phillips et al., 2002; Phillips & Yang, 2004; Yang et al., 2005) identified 895 suicides from twenty rural and three urban geographically representative regions of China from 1 August, 1995 to 31 August, 2000. Two independent interviews with family members and other individuals who knew the subject well were conducted and the data from these interviews were aggregated for analysis. As shown in Table 1, most of the 454 male suicide decedents included in this analysis were young or middle-age adults, lived in rural villages, were married, and were agricultural laborers. More than half of them had received less than six years of formal education and more than half of them had a monthly per capita family income of \$15 (\$US) or less.

2.2. Measures

With the exception of the alcohol-related variables, all of the measures used for the current analysis (described below) distinguished suicides from injury death controls in the seminal analyses of the national study (Phillips et al., 2002). Additional details about the methods and measures used in the National Psychological Autopsy Study are available elsewhere (Phillips et al., 2002; Phillips & Yang, 2004; Yang et al., 2005).

2.2.1. Alcohol-related variables—Alcohol use disorders, including alcohol abuse and alcohol dependence, were diagnosed if suicide decedents met the DSM-IV criteria (American Psychiatric Association, 1994) at any time over the 12 months prior to death. This was determined by administering an adapted version of the Structured Clinical Interview for DSM-IV Axis I Disorders (First, Spitzer, Gibbon, & Williams, 1996) that was revised for use with proxy informants to both the family members and close associates of the decedents; if the diagnoses from the two independent interviews were different, the research team reviewed all of the data to make a final determination. The interrater reliability (assessed using intraclass correlation coefficients) for alcohol use disorders among different coders assessing tape-recorded interviews was 0.94 (Phillips et al., 2002).

Acute alcohol use was considered present if either family members or close associates reported that the decedent was “intoxicated”, “used alcohol but might not be intoxicated,” or “used alcohol but the level of intoxication was unknown” at the time of the suicide. We coded acute alcohol use present if *either* informant responded positively to these probes because false-negative reports are generally a greater threat to validity than false-positive reports in psychological autopsy research (Conner, Duberstein, & Conwell, 2001). In China less than 1% of suicides undergo autopsies, partly because of the lack of resources and partly due to the negative public attitudes about autopsies (Zheng, Fan, & Ng, 1998), so it was not possible to confirm informants’ reports about alcohol use prior to suicide with data on decedents’ blood alcohol concentration. However, the inter-rater correlation of the two independent reports of alcohol use at the time of death was high ($ICC=.87$), confirming the reliability of this method of classifying cases.

Among 454 male suicides, 68 (15.0%) met diagnostic criteria for either alcohol abuse (5 cases) or dependence (63 cases) over the 12 months prior to death (the alcohol use disorder group); 73 (16.1%) used alcohol acutely at the time of suicide but did not have an alcohol use disorder (the acute alcohol use group), and 313 (68.9%) had neither acute alcohol use nor an alcohol use disorder (the non-alcohol group). The alcohol use disorder group included 57 individuals who used alcohol acutely at the time of suicide and 11 who did not; 18 had co-morbid major depressive disorder, 1 had dysthymia, 1 had schizophrenia, 1 had dementia and 1 had mental retardation. None had a comorbid (non-alcohol) substance use disorder which are still infrequent in China and were quite rare at the time the data were gathered.

2.2.2. Other measures—The diagnosis of major depression was based on a structured interview using DSM-IV criteria (American Psychiatric Association, 1994) that was adapted for use with proxy informants. To increase the sensitivity of the interview to detect depression in China, clinical interviewers also used additional, culture-sensitive methods of probing for symptoms of depression (Phillips et al., 2007). Given an absence of data to show that the distinction between primary depression and substance-induced depression can be made reliably using proxy informants, the diagnosis of major depression did not exclude depressive episodes caused by alcohol or other substances. The intraclass correlation coefficients for mood disorders among different coders assessing tape-recorded interviews was 0.87 (Phillips et al., 2002).

History of suicide attempts was collected by asking family members and close associates structured, easily comprehended questions about whether or not the decedent had attempted suicide at any point in their lifetime. If *any* of the informants reported a past attempt, the case was classified as having had a prior attempt.

A measure of the level of overall functioning (quality of life) was assessed using a 6-item scale that evaluated decedents’ physical health, psychological health, economic circumstances, work, family relationships, and relationships with non-family associates in the month prior to death on a 5-point Likert scale (1=very poor to 5=excellent). The average of the sum of the six original scores from the two independent interviews was converted to a range of 0–100. The correlation between the two independent informants for this score was excellent ($ICC=.79$). The primary analysis for the National Psychological Autopsy Study found that this measure is an independent risk factor for suicide even after adjusting for level of depression (Phillips et al., 2002). In the current paper we have dichotomized the measure (by a median split) to make it easier to interpret the results of the logistic regression analyses.

A 60-item life event scale constructed and pre-tested specifically for the National Psychological Autopsy Study obtained the following information for each type of life event: the time of occurrence, the duration of the psychological effects of the event over the 12 months prior to

suicide, and the magnitude of the psychological effect (from none to very severe, coded as 0–4). Negative life events that occurred within two days of the suicide and resulted in a severe or very severe psychological effect (coded as 3 or 4) were classified as acute life events. The chronic stress score was the product of the duration and magnitude of the psychological effect over the year before death, summed for all negative life events that have a psychological effect on the deceased in the year prior to suicide; the correlation of this score between family members and other associate informants was good ($ICC=.69$). The mean score for the two independent informants is dichotomized into high versus low chronic stress (by a median split), consistent with the approach used in prior studies of the National Psychological Autopsy Study (Phillips et al., 2002) and for ease of interpretation of the logistic regression results.

Sociodemographic characteristics considered included age (≤ 34 years, 35–59, ≥ 60 years), location of residence (rural village vs. urban area), educational level (< 6 years vs. ≥ 6 years), monthly per capita income in family [$\leq \$15$ (US) vs. $> \$15$), marital status (not currently married vs. currently married), and employment status (agriculture laborer vs. other).

2.3. Statistical analyses

Analyses were performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA, 2006). A series of univariate multinomial logistic regression models were used to compare the three groups on each of the measures. Variables with a p -value $\leq .30$ were entered into a multivariate multinomial logistic regression model. Backward elimination was used to trim extraneous variables and construct the final statistical model in which the probability level for removal from the model was set as .10. The likelihood ratio test was used to assess the final model and a Pearson Chi-square test provided a measure of goodness-of-fit (Hosmer & Lemeshow, 2000). Derivation of odds ratios and 95% confidence intervals (CIs) for each retained variable was based on maximum likelihood estimation (Hosmer & Lemeshow, 2000).

3. Results

3.1. Univariate multinomial logistic regression analysis

As shown in Table 1, there were no significant differences among the three groups in the location of residence, level of education, per capita family income, and level of chronic stress from negative life events. Compared with the non-alcohol group, subjects with an alcohol use disorder were significantly more likely to be currently married and significantly less likely to have major depression; there were also non-significant trends ($p < .10$) suggesting that subjects with an alcohol use disorder are more likely to experience an acute life event in the two days before the suicide and to have made a prior suicide attempt.

Compared with the non-alcohol group, subjects in the acute alcohol use group were significantly less likely to have major depression, more likely to have a higher level of overall functioning in the prior month, and more likely to have experienced an acute negative life event in the two days before the suicide (Table 1).

Compared with the acute alcohol use group, subjects with an alcohol use disorder were less likely to be agricultural laborers, more likely to have made a prior suicide attempt, and more likely to have a lower level of overall functioning in the month prior to death (Table 1).

3.2. Multivariate multinomial logistic regression analysis

Among the seven variables that met criteria for entry into the multivariate analysis (age, marital status, employment status, diagnosis of major depression, prior suicide attempt, level of overall functioning, and acute life events) four were retained in the final model: marital status, diagnosis of major depression, prior suicide attempt and level of overall functioning (Table 2).

These four variables accounted for 10.0% of the total variance among the three suicide groups. The overall fit of the final model was acceptable [Pearson $\chi^2(244, N=454) = 261.73, p=.21$].

The multivariate analysis found that compared with non-alcohol subjects, subjects with an alcohol use disorder were significantly more likely to be currently married and to have made previous suicide attempts but less likely to meet diagnostic criteria for major depression. Compared with the non-alcohol group, subjects in the acute alcohol use group had a significantly higher level of overall functioning in the month before death, and there was a trend ($p<.10$) towards a lower likelihood of major depression. Compared with subjects in the acute alcohol use group, subjects with an alcohol use disorder had a significantly lower level of overall functioning in the month before death, and there was a trend ($p<.10$) towards a higher likelihood of previous suicide attempts.

Since one of the six components of the overall functioning measure was ‘psychological health’, this measure may overlap with the diagnosis of major depression. To address this possibility we conducted a sensitivity analysis in which the overall functioning variable was computed without the ‘psychological health’ component. This change did not substantially alter the results of the multivariate analysis reported above.

4. Discussion

This secondary analysis of a large, community-based sample of suicides among men from geographically representative regions of China found that 1) consistent with our hypothesis male suicide decedents with an alcohol use disorder were more likely to have made a prior suicide attempt than those whose suicide was unrelated to alcohol ($p<.05$), and perhaps than those without an alcohol use disorder who acutely used alcohol at the time of suicide ($p<.10$); 2) also consistent with our hypothesis, male suicide decedents whose suicide was not associated with alcohol were more likely to have a major depressive disorder than those with an alcohol use disorder ($p<.01$), and perhaps than those without an alcohol use disorder who acutely used alcohol at the time of suicide ($p<.10$); and 3) male suicide decedents who acutely used alcohol prior to suicide but did not have chronic alcohol problems had a comparatively high level of overall functioning in the month before death—a result that was not hypothesized.

The relatively high level of overall functioning in the acute alcohol use group suggests that acute alcohol use may lower the threshold for suicide amongst individuals who are otherwise living adaptively, at least as compared with other groups of suicide decedents. The mechanisms by which alcohol may increase risk among individuals who are functioning adaptively under usual circumstances include, but are not limited to, alcohol-induced psychological distress, aggressiveness, disinhibition, and/or attentional constriction (Hufford, 2001). These proposed mechanisms for the relationship between acute alcohol use and suicidal behavior have good face validity but the relationship has not been adequately researched and we are unaware of any relevant studies in China.

Results show that there is a higher prevalence of major depression in the non-alcohol group (48%) versus that seen in the alcohol use disorder group (27%), indicating the importance of identifying other causal pathways (in addition to depression) that drive risk for suicide among Chinese men with an alcohol use disorder (Conner, Duberstein, & McCloskey, 2008). We also found a higher rate of prior suicide attempt among Chinese men who have an alcohol use disorder at the time of suicide compared with those without an alcohol use disorder, a finding that is consistent with prior (Western) studies of suicide (Pirkola, Isometsa, Heikkinen, & Lonnqvist, 2000) and attempted suicide (Hawton, Fagg, & Mckeown, 1989). This supports suggestions that individuals with alcohol use disorders are at risk for chronic and/or recurrent suicidal behavior. Over and above its role in promoting depressive symptoms, alcohol use

disorders may play a causal role in recurrent suicidal behavior through a number of mechanisms that exacerbate negative life circumstances (e.g., relationship conflicts, economic strife), negative mood states (e.g., anxiety, anger), and risky behaviors (e.g., disinhibition, aggression) and, thus, promote suicidal behaviors (Conner, Duberstein, & McCloskey, 2008). However, these ideas are based on Western studies, the precise mechanisms via which alcoholism creates risk for suicide have not been clearly explicated and research on this topic in China is at a very early stage.

The present study has a number of limitations. First, psychological autopsy data are vulnerable to incompleteness and biases due to a reliance on retrospective accounts of proxy-respondents, but there are no good alternatives to the study of proximal risk factors for lethal acts of suicide particularly in settings where few suicide decedents receive psychiatric care prior to death and where almost none of them receive autopsies. Second, alcohol consumption and alcohol use disorders have increased rapidly in China since the time of the national study (8–13 years ago) so alcohol may currently be involved in a greater proportion of suicides than we report here. Third, despite training to the contrary, there is the potential that some interviewers were reluctant to identify major depressive symptoms among individuals with alcohol use disorders, potentially underestimating the prevalence of depression among these subjects. Fourth, the generalizability of the findings to women in China is unclear. However, the very low prevalence of alcohol use disorder (0.9%) among female suicides and the lower rate of acute use of alcohol at the time of suicide (5.4%) compared with males in the dataset and the results of Western reports, is generally consistent with the low prevalence of drinking and alcohol use disorders among women in China.

In summary, differences in the factors related to suicide in the three groups suggest the need to assess alternative approaches to the prevention and management of suicidal behavior in Chinese men based on their alcohol-use history. About one-third of male suicide decedents in China who had an alcohol use disorder over the year prior to death had a prior suicide attempt, supporting an association between alcoholism and risk of recurrent suicidal behavior and highlighting the need for suicide screening in men with alcohol use problems. Depressive disorder frequently contributes to risk among men whose suicide is not related to alcohol, suggesting the importance of a focus on the recognition and management of depression in the prevention of suicide among such persons. Men in China without chronic alcohol problems who, nevertheless, acutely ingest alcohol at the time of suicide have a higher level of overall functioning prior to death than other suicides, so recognition of suicide risk among these individuals may be especially difficult because they do not have either of the primary risk factors for suicide in men (i.e., depression or alcohol abuse). Future research needs to identify other factors that could distinguish this subgroup of individuals (e.g., impulsiveness) and test strategies for improving their problem solving skills.

Acknowledgments

Role of Funding Sources

The National Psychological Autopsy Study was supported by grants from the Ford Foundation, the Save the Children Fund, and Befrienders International. While preparing this manuscript the first author was supported by U.S. government grants D43 TW05814 (E.D. Caine, PI), D43 TW007273 (E.D. Caine, PI) and P20 MH071897 (E.D. Caine, PI). None of the funding sources had any role in the study design; collection, analysis or interpretation of the data; writing of the manuscript; or in the decision to submit the paper for publication.

The National Psychological Autopsy Study was part of the 'Causes and Prevention of Accidental Deaths in China' project, which was jointly coordinated by the Beijing Hui Long Guan Hospital and the Chinese Centers for Disease Control and Prevention. Participating institutions include 23 Disease Surveillance Points, 16 provincial epidemic prevention centers (Anhui, Fujian, Guangxi, Guizhou, Hebei, Heilongjiang, Henan, Hunan, Jiangxi, Jilin, Shaanxi, Shandong, Shanxi, Sichuan, Qinghai, Zhejiang), and four psychiatric centers (Department of Neuropsychiatry, Xijing Hospital, Xian, Shaanxi Province; Jingzhou City Psychiatric Hospital, Hubei Province; Shenyang Mental Health

Centre, Liaoning Province; and Suzhou Guangji Hospital, Jiangsu Province). The authors thank all the institutions, investigators and respondents for their contribution to the research.

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Table 1

Comparison of Chinese male suicides in the alcohol use disorder, acute alcohol use, and non-alcohol groups using univariate multinomial logistic regression models

Correlates	Alcohol use disorder (n=68)	Acute alcohol use (n=73)	Non-alcohol (n=313)	Alcohol use disorder vs. Non-alcohol OR (95%CI)	Acute alcohol use vs. Non- alcohol OR (95%CI)	Alcohol use disorder vs. Acute alcohol use OR (95% CI)
Age group						
≤34	24(35.3%)	30(41.1%)	101(32.3%)	1.49 (0.74–2.96) [#]	1.24 (0.68–2.26)	1.20 (0.52–2.75)
35–59	28(41.2%)	19(26.0%)	112(35.8%)	1.56 (0.80–3.06) [#]	0.71 (0.37–1.37)	2.21 (0.94–5.22) [†]
≥60	16(23.5%)	24(32.9%)	100(31.9%)	1.00	1.00	1.00
Lives in rural village	53(77.9%)	57(78.1%)	246(78.6%)	0.96 (0.51–1.81)	0.97 (0.52–1.80)	0.99 (0.45–2.20)
Less than six years of formal education	36(52.9%)	40(54.8%)	171(54.6%)	0.93 (0.55–1.58)	1.01 (0.60–1.68)	0.93 (0.48–1.80)
Monthly per head income in family less than or equal to \$15 (US) ^a	37(54.4%)	34(46.6%)	158(50.6%)	1.16 (0.69–1.97)	0.85 (0.51–1.42)	1.37 (0.71–2.66)
Not currently married	21(30.9%)	29(39.7%)	139(44.4%)	0.56 (0.32–0.98) [*]	0.83 (0.49–1.39)	0.68 (0.34–1.36) [#]
Agricultural laborer	35(51.5%)	51(69.9%)	186(59.4%)	0.72 (0.43–1.23) [#]	1.58 (0.92–2.74) [#]	0.46 (0.23–0.91) [*]
Met criteria of major depression at time of death	18(26.5%)	24(32.9%)	150(47.9%)	0.39 (0.22–0.70) ^{**}	0.53 (0.31–0.91) [*]	0.74 (0.36–1.52)
Had made previous suicide attempt	22(32.4%)	13(17.8%)	71(22.7%)	1.63 (0.92–2.89) [†]	0.74 (0.38–1.42)	2.21 (1.01–4.84) [*]
Lower level of overall functioning in month before death	32(47.1%)	20(27.4%)	167(53.4%)	0.78 (0.46–1.31)	0.33 (0.19–0.58) ^{**}	2.36 (1.17–4.75) [*]
Experienced acute life event in two days prior to death	20(29.4%)	25(34.2%)	63(20.1%)	1.65 (0.92–2.98) [†]	2.07 (1.18–3.61) [*]	0.80 (0.39–1.63)
Higher chronic stress in year before death	36(52.9%)	36(49.3%)	154(49.2%)	1.16 (0.69–1.96)	1.01 (0.60–1.67)	1.16 (0.60–2.24)

^a One missing value in the non-alcohol group.

[#] $P < .30$.

[†] $P < .10$.

^{*} $P < .05$.

^{**} $P < .01$.

Table 2

Comparison of Chinese male suicides in the alcohol use disorder, acute alcohol use, and non-alcohol groups using multivariate multinomial logistic regression models

Correlate	Alcohol use disorder vs. Non-alcohol adjusted OR (95%CI)	Acute alcohol use vs. Non-alcohol adjusted (95%CI)	Alcohol use disorder vs. Acute alcohol use adjusted OR (95%CI)
Not currently married	0.51 (0.29–0.91) [*]	0.77 (0.45–1.32)	0.66 (0.33–1.34)
Met criteria of major depression	0.36 (0.20–0.66) ^{**}	0.63 (0.36–1.09) [†]	0.58 (0.27–1.22)
Had made previous suicide attempt	1.94 (1.07–3.53) [*]	0.91 (0.46–1.78)	2.14 (0.96–4.78) [†]
Lower level of overall functioning in month before death	0.82 (0.48–1.43)	0.36 (0.20–0.63) ^{**}	2.31 (1.13–4.74) [*]

[†] $P < .10$.
^{*} $P < .05$.
^{**} $P < .01$.