Alcohol Use and Reasons for Drinking as Risk Factors for Suicidal Behavior in the U.S. Army

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ABSTRACT Objective: High levels of alcohol use and alcohol-related problems are associated with suicidal behaviors (i.e., seriously considering and/or attempting suicide) in military and civilian populations. Examination of reasons for drinking alcohol may identify subgroups of soldiers who may either be at risk for suicidal behaviors or resilient to suicidality. Method: We examined the associations among reasons for drinking, level of alcohol use, and past year suicidality in 3,813 U.S. Army soldiers using the Department of Defense Survey of Health-Related Behaviors among Active Duty Military Personnel. Results: Six percent of soldiers reported suicidal thoughts and behaviors within the past year. Those who reported the highest level of alcohol use were more likely to have seriously considered and/or attempted suicide. Drinking to avoid rejection/"fit in" was associated with suicidality, even after adjusting for level of alcohol consumption, post-traumatic stress disorder, and depression. Although unadjusted analyses revealed a relation of pleasure-seeking drinking motives to suicidality, this association did not remain significant after controlling for covariates. Conclusions: Drinking to avoid rejection/"fit in" is associated with suicidality above overall alcohol consumption. Screening for this reason for drinking may be useful for suicide prediction and prevention.

INTRODUCTION

The rate of suicide in the U.S. Army has steadily increased since the onset of Operation Iraqi Freedom and Operation Enduring Freedom (OIF/OEF), rising from 9 to 22 suicides per 100,000 from 2001 to 2009.[1–3] Historically, U.S. service members have experienced a lower suicide rate than civilians of the same age and gender in the general population.[4–6] Understanding risk and resilience factors for suicidal behaviors (i.e., suicidal ideation, intent and/or plan, and attempt) is critical in order to prevent or mitigate suicidality in this population.[6,7]

High levels of alcohol use and alcohol-related problems are associated with suicide and suicidal behaviors as well as psychiatric disorders, including post-traumatic stress disorder (PTSD) and depression.[8–13] Approximately 12% of Army soldiers who recently returned from Iraq cited alcohol problems.[14] Twenty-two percent of all service members report heavy alcohol use (i.e., 5 or more drinks per typical drinking occasion at least once per week in the past 30 days).[15,16] OEF/OIF veterans who screened positive for alcohol problems are more likely to report suicidal ideation.[17] Twenty-nine percent of Army suicides between 2005 and 2010 involved drug or alcohol use.[18,19] This acute alcohol use rate is slightly lower than that found in civilian suicide completers, for whom 33 to 69% test positive for blood alcohol concentrations at time of death.[20–22]

Despite the strong association of heavy, problematic alcohol use with suicidality, few studies have examined the contribution of motivations for alcohol use to suicide risk. Closer examination of individuals' reasons for drinking may identify subgroups that include psychological, social, cognitive, and potentially biological elements underlying alcohol use and drinking patterns. A better understanding of the complex, multidimensional mechanisms involved in the association between drinking motives as either risk or protective factors and suicidal behaviors may further refine and provide insight into the association between alcohol use and suicide risk.

The reasons individuals choose to use alcohol are associated with different drinking behaviors and contexts.[23,24] These reasons are considered the most proximal factors influencing alcohol use.[25–27] Individuals typically drink alcohol to experience positive effects or avoid or reduce negative feelings or outcomes. In addition, drinking motives may be cued by internal or external sources.[25] Alcohol consumption to avoid negative experiences, such as feelings of rejection or distress, is particularly related to problematic drinking, even after adjusting for overall levels of alcohol use.[26,28,29] Despite the strong social role of alcohol for college-aged adults and the frequent use observed in general in social contexts,[30] social motives for alcohol use, that are primarily found in affiliative contexts, have not been related to heavy or problematic drinking, preoccupation with drinking, or concerns about controlling alcohol use.[26,31–33] In contrast to solitary alcohol use, externally focused drinking that occurs in social settings is associated with fewer adverse consequences.[34–36] Furthermore, social support has been found to be a strong protective factor that fosters resilience, either

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The opinions expressed in the manuscript are those of the authors and, therefore, do not necessarily reflect the views of the Department of Defense and the Uniformed Services University of the Health Sciences.

doi: 10.7205/MILMED-D-15-00122

through resisting or helping to manage stressful events.[37] Although any substance use can potentially produce negative consequences, alcohol use that is motivated by external approach goals, such as social motives, is considered a lower risk for harmful alcohol use patterns and outcomes, as compared with other motives for alcohol use,[30,34] including coping motives (which are characterized by internal avoidance goals) and enhancement motives (which are identified by internal approach goals, such as "drinking to feel good").

Drinking to socially conform or "fit in" may be complicated by the misperception or overestimation of social norms for alcohol use, leading to heavy drinking to match the perceived amount consumed by peers.[38,39] Individuals who are socially anxious, or fear being observed or negatively evaluated by others,[40] may drink to avoid perceived scrutiny from their peers,[41] which may result in alcohol use disorder and social anxiety disorder comorbidity.[42,43]

An individual's reasons for drinking may be an index of suicide risk independent of level of alcohol use or comorbid PTSD and depression. Interestingly, those engaging in suicidal and nonsuicidal self-injury report reasons for engaging in these behaviors that map on to the drinking reasons described above—such as drinking for affect regulation as well as due to social reinforcement.[44,45] It may be that these underlying reasons for such behavior (e.g., a desire to escape from aversive thoughts or feelings) could be helpful in explaining the co-occurrence of alcohol-related and suicidal behavior. To our knowledge, the association of drinking reasons and alcohol use levels to suicidality has not been examined previously, particularly in service members. This study examined the associations among drinking motives, alcohol use, PTSD, depression, and suicidality in a representative sample of U.S. Army soldiers.

METHOD

Participants and Procedures

The target population of the 2008 Department of Defense (DoD) Survey of Health-Related Behaviors among Active Duty Military Personnel (DoD HRB) included all active duty service members of the U.S. Military with the exception of recruits, academy cadets, and those who were absent without leave or incarcerated. More detailed discussion of sampling methods can be found elsewhere.[15,46] First, a methodology of stratified, probability proportional to size by service and region of the world was applied. The sample was then stratified by pay grade and gender, and officers and women were oversampled to account for low numbers in these groups. The survey data were weighted to represent the active duty population, and sampling and nonresponse differences were accounted for in the weighting. Of the 10,400 active duty U.S. Army service members who were sampled, 5,927 provided responses. To examine the association of drinking motives and alcohol use to suicidality, lifetime alcohol users were identified (85% of the active Army; N = 4,922). Of this group, 3,813 soldiers (weighted N = 334,021) had completed all relevant survey items, including demographics, depression, PTSD, past year suicidality, and alcohol use and drinking motives items, and were used in our analysis. About 43% of the lifetime alcohol users were aged 17 to 25 (N = 1,600), 87% (N = 2,840) were male, 67% (N = 2,305) were non-Hispanic white, 31% (N = 1,110) had a high school education or less, 43% (N = 1,730) were unmarried, and 80% (N = 2,968) were enlisted (Table I). Survey respondents were apprised of the anonymous and voluntary nature of the self-report written survey, and informed consent was obtained before study inclusion. The study was approved by the Institutional Review Board of the Uniformed Services University of the Health Sciences in Bethesda, MD.

Measures

Suicidality

Participants responded to two questions that assessed suicidality ("Have you seriously considered suicide?" and "Have you ever attempted suicide?") based on their own definitions of suicidal ideation and suicide attempt. The current investigation examined only those who indicated suicidality (i.e., answered "yes" to either or both questions) in the past year. These questions were collapsed into a single dichotomous variable indicating presence or absence of suicidality.

Average Daily Alcohol Use

An index of average daily ethanol consumption was derived from item responses that measured participants' typical drinking patterns over the past 30 days, and those identifying episodes of heavier use over the past year.[15] To measure typical volume of alcohol use, the reported number of ounces of beer, wine, and liquor (accounting for quantity and frequency) were converted into number of ounces of ethanol. Based on the distribution of the average daily ethanol consumption amounts for all participants, a cutoff value of 1.72+ ounces for men and 0.86+ ounces for women represented heavy alcohol use in our sample. The average daily amount identified in our higher level corresponds with the definition for heavy drinking specified by the National Institute on Alcohol Abuse and Alcoholism.[47] These values are slightly more stringent than classification guidelines of the Centers for Disease Control,[48] which identifies heavy drinking as an average of >2 drinks/day for men and >1 drink/day for women (with a standard drink consisting of 0.6 ounces of ethanol).[49]

Reasons for Drinking

A modification of the Drinking Motives Questionnaire-Revised (DMQ-R)[26] was used in this study. The DMQ-R is a 20-item measure that assesses four reasons for drinking, including enhancement (to enhance positive mood), social (to obtain social rewards), conformity (to avoid social costs), and coping (to regulate negative affect) motives. The original DMQ-R exhibits high internal consistency (α = 0.82–0.89)

TABLE I. Demographics, Alcohol Use, Drinking Motives, and Suicidality[a] among Lifetime Alcohol Users in the U.S. Army

	Whole Sample			Heavy Drinkers			Light/Moderate Drinkers		
Risk Factors	Weighted Proportion (%)	Weighted *N*	Unweighted *N*	Weighted Proportion (%)	Weighted *N*	Unweighted *N*	Weighted Proportion (%)	Weighted *N*	Unweighted *N*
	100	334,021	3,813	100	108,076	1,210	100	225,944	2,603
Demographics									
Age									
17–20	10	33,497	336	12	12,712	131	9	20,785	205
21–25	33	111,777	1,264	44	47,090	520	29	64,688	744
26–34	33	109,088	1,278	30	32,856	384	34	76,233	894
≥35	24	79,658	935	14	15,419	175	28	64,239	760
Gender									
Male	87	291,654	2,840	89	95,765	924	87	195,890	1,916
Female	13	42,366	973	11	12,312	286	13	30,055	687
Race									
Non-Hispanic White	67	224,646	2,305	66	70,802	696	68	153,844	1,609
Other	33	109,375	1,508	34	37,274	514	32	72,100	994
Education									
High School or Less	31	103,064	1,110	44	47,634	505	25	55,430	605
Some College	46	152,411	1,759	43	46,601	546	47	105,809	1,213
College Degree or More	24	78,546	944	13	13,841	159	29	64,705	785
Married									
No	43	144,001	1,730	55	58,955	696	38	85,046	1,034
Yes	57	190,020	2,083	45	49,121	514	62	140,899	1,569
Enlisted									
No	20	65,563	845	11	11,920	142	24	53,643	703
Yes	80	268,458	2,968	89	96,157	1,068	76	172,301	1,900
Average Daily Alcohol Use									
Light/Moderate	68	225,944	2,603	—	—	—	—	—	—
Heavy	32	108,076	1,210	—	—	—	—	—	—
≥1.72 oz. for men ≥0.86 oz. for women									
Depression									
No	65	216,850	2,445	53	57,382	627	71	159,467	1,818
Yes	35	117,171	1,368	47	50,694	583	29	66,477	785
PTSD									
No	88	293,781	3,346	79	84,944	948	92	208,837	2,398
Yes	12	40,240	467	21	23,132	262	8	17,107	205
Avoid Rejection/"Fit in" Motive[b]									
Low	24	81,819	976	17	18,658	225	28	63,161	751
Medium	44	145,531	1,684	39	42,497	470	46	103,035	1,214
High	32	106,670	1,153	43	46,921	515	26	59,749	638
Pleasure-Seeking/Enjoyment Motive[b]									
Low	33	110,448	1,335	13	13,743	165	43	96,705	1,170
Medium	34	113,272	1,291	31	33,206	393	35	80,067	898
High	33	110,301	1,187	57	61,128	652	22	49,173	535
Suicidality[a]									
No	94	315,108	3,583	92	99,862	1,110	95	215,246	2,473
Yes	6	18,913	230	8	8,214	100	5	10,699	130

[a]Suicidality is defined as seriously considered and/or attempted suicide in the past year. [b]Levels of drinking motive were defined by tertiles of factor scores among lifetime alcohol users in the U.S. Army.

and good construct and predictive validity. Specifically, each of the drinking motives identified by the DMQ-R have been associated with a distinct pattern of alcohol use and alcohol-related consequences.[26,31]

The DoD HRB survey included a subset of the DMQ-R items, excluding the five DMQ-R items categorized as enhancement items. In addition, four of the original five DMQ-R social items, three of the five coping items, and four of the five conformity items were included in the HRB survey. This survey also contained two additional general items (i.e., To relax and I like to drink/I enjoy drinking). Due to the differences in the DMQ-R items represented in the HRB survey, and the differences in the survey populations, we conducted an exploratory factor analysis to establish the factor structure of the reasons for drinking items with the current sample.[50] Principal-axis factor analysis with promax rotation was used

and identified two factors. These factors represented avoiding rejection/ "fitting in" (e.g., so that others won't kid/tease you about not drinking; to fit in with people you like) and pleasure seeking/enjoyment (e.g., as a way to celebrate; because it makes social gatherings more fun), and were the factors used in our current analyses. Participants rated the relative frequency of drinking based on each particular reason, using a scale ranging from 1 (almost never/never) to 5 (almost always/always). Low, medium, and high levels of each factor were categorized by tertiles (33%), with a high pleasure-seeking motive for drinking defined by factor scores of 0.0490 or greater, a medium level defined by factor scores between −0.0499 and 0.0490, and a low level of pleasure-seeking motives indicated by factor scores less than −0.0499. Similarly, high avoiding rejection/"fitting in" motives were represented by factor scores of −0.0084 or greater, and scores for medium and low levels of this factor ranged from −0.0636 to −0.0084 and less than −0.0636, respectively. In addition, to determine the percent population attributable risk (%PAR) of suicidality based on the factors, above that of heavy drinking and demographics, we dichotomized both factors into low/medium (tertiles 1 and 2) and high (tertile 3) motive groups.

Post-Traumatic Stress Disorder

The presence of PTSD was assessed with the 17-item PTSD Checklist-Civilian Version (PCL-C).[51] The PCL-C lists all PTSD symptoms identified in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR). The civilian version was selected in order for the PTSD symptoms resulting from either military or nonmilitary traumas to be assessed. Respondents indicated the extent to which they had been bothered by each symptom in the past month on a scale ranging from 1 (not at all) to 5 (extremely). Responses were summed to produce PTSD symptom severity scores ranging from 17 to 85. Participants were classified as positive for PTSD if they had scores ≥50 and also met the following DSM-IV-TR symptom criteria: at least one intrusion (Criterion B), three avoidance (Criterion C), and two hyperarousal (Criterion D) symptoms, each present at the level of moderate or higher intensity during the previous month.[52,53] The PCL-C exhibits good internal consistency[51] and high diagnostic accuracy as compared to structured clinical interviews (0.80–0.90), with a specificity of 0.97 using a cutoff score of 50.[54] Standardized Cronbach's α in the current study was 0.97, indicating high internal consistency.

Depression

The presence of depression was measured with the 10-item Center for Epidemiologic Studies Depression Scale,[55] a short version of a 20-item scale designed to measure depressive symptoms in the general population.[56] Respondents indicated the extent to which they had been bothered by each symptom in the past week on a scale ranging from 0 (rarely/none of the time) to 3 (most/all of the time), and total score for the 10-item scale ranges from 0 to 30. The cutoff score for probable depression is 10 or greater.[55] The 10-item scale has been validated against semistructured diagnostic interviews, with area under curve values of 0.87 to 0.88, sensitivity ratings of 0.76 to 0.90, and specificity ratings of 0.72 to 0.79.[57,58] Overall test–retest reliability has been found to be adequate at 0.71 over an average test–retest interval of 22 days.[55] Standardized Cronbach's α in the current study was 0.82, indicating relatively high internal consistency.

Statistical Analyses

Prevalence rates for past year suicidality were computed for each risk factor, and chi-square tests were used to examine the association between suicidality and each risk factor. Bivariate (unadjusted) logistic regressions were conducted to examine associations between suicidality and alcohol use and suicidality and reasons for drinking, respectively. In order to examine the association of suicidality with drinking reasons while taking into account level of alcohol use, average daily ethanol consumption was included as a covariate in the multivariate (adjusted) logistic regression model. Adjustments were also made for demographic variables and presence of PTSD and depression in the multivariate model, due to the associations of PTSD, depression, and their comorbidity with past year suicidality previously found in the same Army sample.[13] In order to examine whether the associations between drinking motives and past year suicidality differ by alcohol use level, cross-product terms (i.e., interaction of drinking motives × alcohol use level [heavy vs. light/moderate]) were included in the regression models. Odds ratios (ORs), 95% confidence intervals (CIs), chi-square test statistics, and the corresponding p values were reported. The associations of suicidality with the two drinking motives were also assessed using %PAR. In this study, %PAR identifies the proportion of observed suicidality that would not have occurred if the effects attributable to a high drinking motive (i.e., pleasure-seeking and avoiding rejection motives) were reduced to a reference level, assuming that the coefficients in the model represent causal effects of the predictors.[59] All reported analyses were conducted while accounting for weighted data and the complex survey design. SAS version 9.3 (SAS Institute, Cary, North Carolina) was used for all statistical analyses.

RESULTS

Six percent (weighted N = 18,913) of the Army service members reported suicidality within the past year (Table I). Those who reported past year suicidality were more likely to be unmarried ($\chi^2[1] = 7.76$, $p < 0.01$), enlisted ($\chi^2[1] = 6.80$, $p < 0.01$), and had a lower education level (some college or less; $\chi^2[2] = 10.80$, $p < 0.01$). Thirty-two percent of soldiers (weighted N = 108,076) were classified as heavy drinkers. Heavy drinkers were more likely to be younger (17–25 years; $\chi^2[3] = 72.38$, $p < 0.001$), unmarried ($\chi^2[1] = 79.90$, $p < 0.001$), enlisted ($\chi^2[1] = 25.28$, $p < 0.01$), and to have a

lower education level (high school or less; $\chi^2[2] = 72.50$, $p < 0.001$) than light/moderate drinkers.

Eight percent (weighted $N = 8{,}063$) of those who were in the highest avoid rejection/"fit in" motive group and approximately 7% (weighted $N = 8{,}170$) of those who were in the highest pleasure-seeking/enjoyment motive group reported past year suicidality (Table II). Soldiers classified in the highest avoid rejection/"fit in" motive group (32%; weighted $N = 106{,}670$) and those in the highest pleasure-seeking/enjoyment motive group (33%; weighted $N = 110{,}301$) were more likely to be younger ($\chi^2[6]$) = 17.19, $p < 0.01$ and $\chi^2[6] = 111.05$, $p < 0.001$, respectively), male ($\chi^2[2]$) = 48.60, $p < 0.001$ and $\chi^2[2] = 58.72$, $p < 0.001$, respectively), and unmarried ($\chi^2[2] = 48.76$, $p < 0.001$ and $\chi^2[2] = 66.88$, $p < 0.001$, respectively). Soldiers who reported drinking for pleasure-seeking/enjoyment reasons were also more likely to be non-Hispanic white ($\chi^2[2] = 20.38$, $p < 0.001$) and had a lower education level (high school or less; $\chi^2[4] = 44.01$, $p < 0.001$).

Lifetime Alcohol Users: Alcohol Use, Drinking Motives, and Suicidality

Among soldiers who use alcohol, those who were classified as heavy drinkers were 1.65 times more likely to report past year suicidality compared to soldiers who consumed less alcohol (Wald $\chi^2[1] = 7.40$, $p = 0.001$; Table II). Heavy drinking continued to be associated with suicidality after adjusting for demographics (OR = 1.53, Wald $\chi^2[1] = 5.30$, $p = 0.02$). Drinking to avoid rejection/"fit in" was associated with suicidality (overall $\chi^2[2] = 11.15$, $p < 0.01$). Among soldiers who use alcohol, those who drink to avoid rejection/"fit in" (highest tertile vs. lowest tertile) were 1.95 times more likely to report past year suicidality (Wald $\chi^2[1] = 9.18$, $p < 0.01$; Table II). Drinking for pleasure seeking/enjoyment was associated with suicidality (overall $\chi^2[2] = 8.22$, $p = 0.016$). Pairwise comparison of high vs. medium levels of this motive revealed that those who reported a high level of pleasure-seeking/enjoyment motives were 1.87 times more likely than those with a medium level to report suicidality (Wald $\chi^2[1] = 7.23$, $p < 0.01$).

In multivariate analyses, adjusting for demographics, level of alcohol use, PTSD, depression, and the drinking motives, there continued to be a significant association between avoiding rejection/"fitting in" motives and suicidality (overall $\chi^2[2] = 6.10$, $p = 0.047$; Table II). Specifically, those reporting the highest avoid rejection/"fit in" motive level were 1.78 times more likely to report suicidality (Wald $\chi^2[1] = 4.70$, $p = 0.03$) than those who did not report conformity-related drinking reasons. Closer examination of the %PAR of suicidality, estimated by the adjusted OR of the avoiding rejection/"fitting in" factor (tertile 3 vs. tertiles 1 and 2), revealed that 11.4% of the suicidality cases over and above the contribution of demographic factors, heavy drinking, depression, PTSD, and the pleasure-seeking/"fitting in" motive may be attributable to the presence of high levels of this motive. An

TABLE II. Lifetime Alcohol Users in the U.S. Army: Alcohol Use and Reasons for Drinking as Risk Factors for Suicidality[a]

		Unadjusted				Adjusted[c]			
		Likelihood of Suicidality		Analysis[d]		Likelihood of Suicidality		Analysis[d]	
Risk Factors	Prevalence of Suicidality (%)[b]	OR	95% CI	χ^2	p	OR	95% CI	χ^2	p
Average Daily Alcohol Use				7.40	0.007*			0.05	0.822
Light/Moderate	5	(Reference)							
Heavy	8	1.65*	1.15–2.38	7.40	0.007*	1.05	0.67–1.65	0.05	0.822
Depression				28.28	0.000*			7.37	0.007*
No	3	(Reference)							
Yes	10	3.43*	2.18–5.41	28.28	0.000*	2.03*	1.22–3.39	7.37	0.007*
PTSD				162.36	0.000*			71.11	0.000*
No	4	(Reference)							
Yes	17	4.95*	3.87–6.32	162.36	0.000*	2.95*	2.29–3.79	71.11	0.000*
Avoid Rejection/"Fit in" Motive[e]				11.15	0.004*			6.10	0.047*
Low	4	(Reference)							
Medium	5	1.31	0.80–2.14	1.14	0.286	1.30	0.76–2.21	0.93	0.335
High	8	1.95*	1.27–3.00	9.18	0.002*	1.78*	1.06–3.00	4.70	0.030*
Pleasure-Seeking/Enjoyment Motive[e]				8.22	0.016*			3.29	0.193
Low	5	(Reference)							
Medium	4	0.73	0.44–1.22	1.45	0.228	0.57	0.31–1.05	3.24	0.072
High	7	1.37	0.94–1.98	2.74	0.098	0.74	0.41–1.32	1.06	0.303

χ^2 = Wald chi-square test statistics *$p < 0.05$ [a]Suicidality is defined as seriously considered and/or attempted suicide in the past year. [b]Percentages were based on the weighted sample. Weighted total $N = 334{,}021$; unweighted total $N = 3{,}813$. [c]Adjusted for age, gender, race, education, marital status, enlistment status, average daily alcohol use, depression, PTSD, avoid rejection/"fit in" motive, and pleasure-seeking/enjoyment motive. [d]Analysis includes overall Wald chi-square tests (degrees of freedom ≥ 1), followed by pairwise Wald chi-square tests (degrees of freedom = 1). [e]Levels of drinking motive were defined by tertiles of factor scores among lifetime alcohol users in the U.S. Army.

association was not found between pleasure-seeking/enjoyment motives and suicidality in the entire sample. Further examination of the association of drinking level with drinking motives revealed an interaction between drinking level and pleasure-seeking/enjoyment motives (overall $\chi^2[2] = 7.33$, $p = 0.026$), indicating that the association between pleasure seeking/enjoyment and suicidality may be influenced by drinking level. The interaction between drinking level and avoiding rejection/"fitting in" motives was not significant (overall $\chi^2[2] = 1.54$, $p = 0.463$).

In order to more broadly investigate the extent to which multivariate models of drinking motives may differ based on level of alcohol use, we examined participants stratified by two drinking levels (i.e., heavy drinkers and light/moderate drinkers).

Heavy Drinkers

Among soldiers who were heavy drinkers, multivariate analyses revealed that those who were lower in pleasure-seeking/enjoyment motives were at a higher risk for suicidality (for medium pleasure-seeking motives: OR = 0.39, Wald $\chi^2(1) = 3.93$, $p < 0.047$; for high pleasure-seeking motives: OR = 0.32, Wald $\chi^2(1) = 8.76$, $p < 0.01$; Table III).

Light/Moderate Drinkers

Among soldiers who were light/moderate drinkers, there was an overall association between pleasure-seeking/enjoyment motives and suicidality ($\chi^2[2] = 6.97$, $p = 0.031$; Table IV). A pairwise comparison in light/moderate drinkers, comparing those who reported high vs. medium levels of pleasure-seeking/enjoyment motives, revealed an adjusted OR of 2.04 ($\chi^2[1] = 6.11$, $p = 0.013$), indicating that light/moderate drinkers with high pleasure-seeking motives were at greater risk for suicidality as compared to those with medium pleasure-seeking drinking motives. A similar pattern of increased risk of suicidality was not found for those who reported high vs. low pleasure-seeking/enjoyment motives.

DISCUSSION

In the U.S. Army, suicidal behaviors have increased substantially since 2005.[2,6,60–62] Approximately 15% of Army service members report either seriously considering or attempting suicide in their lifetimes,[46,63] with lifetime prevalence estimates identified as 13.9% for suicidal ideation, 5.3% for suicidal plans, and 2.4% for suicide attempts.[64] Among soldiers in the current study, 6% reported past year suicidality. History of suicidal ideation or attempts in the past year identifies individuals at risk for future suicide attempts and completion. Alcohol use is associated with high stress levels and chronic stress related to deployment (e.g., combat exposure with threat of death or injury, separation from family, little time off, lack of privacy), multiple deployments, potentially short dwell time, and alternating periods of boredom and high

TABLE III. Heavy Drinkers in the U.S. Army: Alcohol Use and Reasons for Drinking as Risk Factors for Suicidality[a]

		Unadjusted				Adjusted[c]			
		Likelihood of Suicidality		Analysis[d]		Likelihood of Suicidality		Analysis[d]	
Risk Factors	Prevalence of Suicidality (%)[b]	OR	95% CI	χ^2	P	OR	95% CI	χ^2	p
Depression				18.23	0.000*			7.73	0.005*
No	3	(Reference)							
Yes	13	5.42*	2.49–11.77	18.23	0.000*	3.35*	1.43–7.84	7.73	0.005*
PTSD				33.14	0.000*			11.44	0.001*
No	4	(Reference)							
Yes	19	5.28*	3.00–9.30	33.14	0.000*	2.93*	1.57–5.46	11.44	0.001*
Avoid Rejection/"Fit in" Motive[e,f]				3.71	0.156			3.02	0.221
Low	7	(Reference)							
Medium	6	0.87	0.42–1.79	0.14	0.704	1.26	0.56–2.84	0.30	0.584
High	9	1.4	0.68–2.87	0.85	0.356	2.12	0.75–6.01	2.01	0.156
Pleasure-seeking/Enjoyment Motive[e,f]				5.21	0.074			9.20	0.010*
Low	12	(Reference)							
Medium	6	0.46*	0.22-0.97	4.16	0.041*	0.39*	0.15–0.99	3.93	0.047*
High	7	0.59	0.34–1.02	3.51	0.061	0.32*	0.15–0.68	8.76	0.003*

χ^2 = Wald chi-square test statistics, *$p < 0.05$ [a]Suicidality is defined as seriously considered and/or attempted suicide in the past year. [b]Percentages were based on the weighted sample. Weighted total $N = 108{,}076$; unweighted total $N = 1{,}210$. [c]Adjusted for age, gender, race, education, marital status, enlistment status, depression, PTSD, avoid rejection/"fit in" motive, and pleasure-seeking/enjoyment motive. [d]Analysis includes overall Wald chi-square tests (degrees of freedom ≥ 1), followed by pairwise Wald chi-square tests (degrees of freedom = 1). [e]Levels of drinking motive were defined by tertiles of factor scores among lifetime alcohol users in the U.S. Army. [f]An additional multivariate regression model was conducted to detect interactions of drinking motives by average daily alcohol use:—Avoiding Rejection/"Fit in" Motive × Average Daily Alcohol Use ($\chi^2 = 1.54$, $p = 0.463$)—Pleasure-Seeking/Enjoyment Motive × Average Daily Alcohol Use ($\chi^2 = 7.33$, $p = 0.026$*).

— Avoiding Rejection/"Fit in" Motive × Average Daily Alcohol Use ($\chi^2 = 1.54$, $p = 0.463$)
— Pleasure-Seeking/Enjoyment Motive × Average Daily Alcohol Use ($\chi^2 = 7.33$, $p = 0.026$*)

TABLE IV. Light/Moderate Drinkers in the U.S. Army: Alcohol Use and Reasons for Drinking as Risk Factors for Suicidality[a]

		Unadjusted				Adjusted[c]			
		Likelihood of Suicidality		Analysis[d]		Likelihood of Suicidality		Analysis[d]	
Risk Factors	Prevalence of Suicidality (%)[b]	OR	95% CI	χ^2	p	OR	95% CI	χ^2	p
Depression				15.63	0.000*			3.33	0.068
No	3	(Reference)							
Yes	8	2.48*	1.58–3.89	15.63	0.000*	1.67	0.96–2.89	3.33	0.068
PTSD				38.80	0.000*			20.07	0.000*
No	4	(Reference)							
Yes	14	4.12*	2.64–6.43	38.80	0.000*	2.92*	1.83–4.67	20.07	0.000*
Avoid Rejection/"Fit in" Motive[e,f]				9.88	0.007*			2.26	0.323
Low	3	(Reference)							
Medium	5	1.55	0.95–2.53	3.05	0.081	1.43	0.79–2.58	1.40	0.236
High	6	1.99*	1.27–3.11	9.13	0.003*	1.63	0.86–3.12	2.22	0.136
Pleasure-Seeking/Enjoyment Motive[e,f]				9.28	0.010*			6.97	0.031*
Low	5	(Reference)							
Medium	3	0.72	0.41–1.27	1.32	0.251	0.60	0.29–1.23	1.94	0.164
High	7	1.64	0.92–2.91	2.84	0.092	1.23	0.54–2.80	0.25	0.620

χ^2 = Wald chi-square test statistics, *$p < 0.05$ [a]Suicidality is defined as seriously considered and/or attempted suicide in the past year. [b]Percentages were based on the weighted sample. Weighted total N = 225,944; unweighted total N = 2,603. [c]Adjusted for age, gender, race, education, marital status, enlistment status, depression, PTSD, avoid rejection/"fit in" motive, and pleasure-seeking/enjoyment motive. [d]Analysis includes overall Wald chi-square tests (degrees of freedom ≥ 1), followed by pairwise Wald chi-square tests (degrees of freedom = 1). [e]Levels of drinking motive were defined by tertiles of factor scores among lifetime alcohol users in the U.S. Army. [f]An additional multivariate regression model was conducted to detect interactions of drinking motives by average daily alcohol use:

— Avoiding Rejection/"Fit in" Motive × Average Daily Alcohol Use ($\chi^2 = 1.54$, $p = 0.463$)
— Pleasure-Seeking/Enjoyment Motive × Average Daily Alcohol Use ($\chi^2 = 7.33$, $p = 0.026$*)

stress.[5,65–68] Alcohol use and problematic drinking have been associated with suicidality in military populations.[11,14,69] A better understanding of individuals' reasons for drinking and their associations with alcohol use may further identify risk-taking behaviors and those at risk for suicidality, as well as determine which protective factors may strengthen resilience to stressful events. Reasons for alcohol use may be particularly relevant within the military environment, in which work and living situations are closely connected.

In this study, soldiers who reported high avoid rejection/"fit in" motives for drinking were two times more likely to report suicidality in the past year, even after adjusting for level of alcohol use, PTSD, and depression. Although this finding was not significant in our drinking level subgroup analyses (i.e., separate heavy and light/moderate alcohol use subsample analyses), the directions of the ORs found in the entire sample and the subgroups were similar. Those who reported high avoiding rejection/"fitting in" motives may experience social attachments and support from others as tenuous, and may be more at risk for disruptions to their social ties. Disruption to social connections may be a particularly salient crisis for those who persistently use high levels of alcohol to maintain social ties. Those who are motivated to drink to avoid rejection/"fit in" may be a subgroup of individuals who experience a low sense of belongingness or feelings of alienation from valued groups, which have been associated with suicidal behavior in a variety of populations.[70] Interventions targeting individuals with high avoiding rejection or fitting in motives may help develop more adaptive strategies to foster and maintain social ties, and reduce the risk for adverse psychological and behavioral sequelae. Promoting resilience through strengthening emotional ties and social support helps to buffer against negative stress responses and mental health disorders in military[71] and civilian[72] populations.

Among all soldiers, those who reported being highly motivated to drink for pleasure-seeking reasons or positive social rewards were not more likely to report past year suicidality, after adjusting for demographics, level of alcohol use, and PTSD and depression. However, specifically those who were heavy drinkers and reported pleasure-seeking/enjoyment motives were at a lower risk for suicidal behavior. Although this effect was not observed in the entire sample, for this subsample of heavy alcohol users, drinking for pleasure seeking/enjoyment appears to have a protective effect. The pleasure-seeking/enjoyment motive was also associated with suicidality in light/moderate drinkers; however, the pattern is not clear. These results highlight the increased risk of suicidality for those who report low and high levels of pleasure-seeking/enjoyment motives for alcohol use; however, further analysis of pleasure-seeking motives among light/moderate and heavy drinkers with a larger sample is needed. Drinking to enjoy social gatherings has been associated with nonproblematic use as compared with drinking to reduce distress, which has been related to more problematic and solitary alcohol use.[26] Similarly, moderate alcohol use

in young adults was associated with more social interaction and/or more intimate relationships as compared with little alcohol use or the heaviest consumption (i.e., high levels of binge drinking).[73] Soldiers who typically drink in social contexts for pleasure-seeking reasons may have a stronger sense of belongingness, a higher level of social support, and a more stable social support network, which may play a protective role and foster resilience by circumventing negative psychological and behavioral outcomes,[74] and reducing the risk of suicidality.

Personality variables, including anxiety sensitivity, sensation seeking, hopelessness and impulsivity, and interpersonal characteristics, have been associated with specific drinking motives and, in turn, alcohol use patterns.[75–78] In particular, anxiety sensitivity and hopelessness are strongly related to conformity motives.[77,78] Certain underlying characteristics, such as impulsivity and hopelessness, have similarly been associated with suicide risk.[79–82] Suicide attempts have been associated with the desire to stop or escape bad feelings,[45] which corresponds to the negative affect associated with these experiences. These personality constructs could potentially provide a route to understanding the associations of alcohol use motives with suicide risk.

Several methodological limitations should be considered in the interpretation of the study findings. Because this is a cross-sectional study, further research using longitudinal designs is needed to better determine the causal connection of drinking motives to alcohol use and suicidality before and after enlistment. We used past year suicidality as a measure of suicide risk. Because suicide is a relatively rare event, large samples are needed to better address time/causality relations. The survey employed procedures to promote honesty on self-report studies, such as ensuring respondents' anonymity, having command leadership leave the room during the survey, and explaining the survey purpose.[46] However, recall bias and social desirability could result in under- or misreporting of substance use and/or suicidality. Although this dataset did not allow us to examine drinking motives that are internally cued and produce positive effects (i.e., enhancement motives),[26] future studies would benefit from further examination.

Examination of these particular drinking reasons provides valuable information regarding those who may be at risk for problematic drinking and suicidal behavior. From this perspective, based on the adjusted %PAR, attenuating the avoiding rejection/fitting in reason for drinking would contribute to the potential reduction of suicidality, above and beyond the independent influence of heavy drinking. In fact, the population impact in terms of proportion of suicidality events by drinking reasons has the same magnitude as amount of alcohol use. This finding has potential prevention, assessment, and treatment implications for U.S. Army service members, and suggests the importance of further research on alcohol use patterns in this population. Future studies focused on drinking motives and associated alcohol use in military populations, as well as their relation to other identified suicidality risk factors, would allow for targeted prevention and intervention efforts based on soldiers' reported drinking reasons, and circumvent or reduce the possibility of adverse psychological and behavioral outcomes related to problematic alcohol use.

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