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The Prevalence of Binge Drinking and Receipt of Provider Drinking Advice among U.S. Veterans with Military Service in Iraq or Afghanistan

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Abstract

Background—Binge drinking is a significant public health concern linked to a number of health and psychosocial problems. Military service in Afghanistan (OEF) and Iraq (OIF) has been associated with posttraumatic stress disorder (PTSD) and increased hazardous drinking. Brief alcohol interventions may reduce hazardous drinking but are infrequently provided to at-risk drinkers.

Objectives—This study examined the association of combat exposure, PTSD symptoms, binge drinking, use of VA and non-VA healthcare services, and the incidence of provider drinking advice.

Methods—OEF/OIF veterans ($N = 1,087$) completed measures of demographics, military history, combat exposure, PTSD symptoms, and binge drinking as part of a confidential mail survey study conducted in 2009 and 2010 (response rate = 29%). Patient report of receiving advice in the past year from a provider about their drinking was queried for frequent binge drinkers. The association of demographic variables, combat exposure, PTSD, and use of healthcare services with binge drinking and receipt of provider drinking advice was estimated using logistic regression.

Results—Overall, 51% of the sample reported at least one episode of binge drinking in the past year and 19% were identified as frequent binge drinkers. PTSD was related to frequent binge drinking. At-risk veterans using VA healthcare services were significantly more likely to receive provider drinking advice (50%) than veterans not using VA (13.4%).

Conclusions—There is a need for increased vigilance and action to identify and counsel at-risk veterans about alcohol misuse in this population.

Background

Binge drinking is a significant public health concern. In the U.S. alone, excessive alcohol use is responsible for an average of approximately 80,000 deaths and costs an estimated \$223.5 billion each year (1). Binge drinking accounts for more than half of the deaths attributable to excessive alcohol use and three-fourths of the economic costs (1). Binge drinking is related to a number of health and psychosocial problems including increased risk of hypertension, acute myocardial infarction, unsafe sexual activity, motor vehicle accidents, violence, and suicide (2-8). It is estimated that 17% of U.S. adults regularly engage in binge drinking (9). While definitions of binge drinking vary between studies, it is clear that binge

drinking, or consuming a large amount of alcohol in a short period of time, is associated with numerous health problems.

Excessive alcohol use and binge drinking are a concern for returning veterans with service in Iraq and Afghanistan. A number of studies have documented elevated rates of potentially hazardous alcohol consumption (26.5%-40.0%) in cohorts of veterans with service in Iraq and Afghanistan who are using Veterans Health Administration (VA) healthcare services (10-18). Calhoun and colleagues (11) found that binge drinking, conservatively defined as consuming 6 or more drinks on one occasion at least monthly in the past year, was prevalent among 23% of OEF/OIF veterans using VA services and was associated with younger age, being male, and being single. Data from the Millennium Cohort Study estimated the prevalence of any binge drinking among veterans in the past year to be between 44%-58%. The same study also reported that binge drinking was associated with younger age, being male, combat exposure, and the presence of posttraumatic stress disorder [PTSD; (19)], leading some to speculate that increased binge drinking and alcohol misuse among veterans may be, in part, an attempt to self-medicate combat-related PTSD or depression (19-21).

Brief alcohol interventions, including simple advice to drink within recommended limits, have been shown to be effective and can reduce alcohol use and associated healthcare costs (14, 22, 23). Despite recommendations to screen and treat alcohol misuse in primary care, relatively few at-risk drinkers receive brief interventions or advice from healthcare providers about their alcohol use (11, 14, 15, 24, 25). Recognizing that alcohol misuse is a significant concern among veterans, the VA has implemented screening for hazardous drinking as a first step toward implementation of evidence-based brief alcohol counseling (26). In contrast, most private managed care organizations have not implemented systematic screening for alcohol misuse (27).

The purpose of this study was to examine the demographic and clinical correlates of binge drinking in a random sample of OEF/OIF veterans and to examine correlates of receipt of provider drinking advice among those that engaged in frequent binge drinking. It was hypothesized that after accounting for demographic and military factors, PTSD would be uniquely related to binge drinking. It was also expected that frequent binge drinkers using VA healthcare would be more likely to have received provider drinking advice than veterans who engage in frequent binge drinking but receive their healthcare outside the VA.

Method

Sample

A random sample of 5,000 OEF/OIF veterans with a last known address in the VA Mid-Atlantic Region catchment area (i.e., North Carolina, the greater part of Virginia, and the southeastern corner of West Virginia), was identified through a data use agreement with the VA Environmental Epidemiology Service to take part in the OEF/OIF Veterans Health and Needs Study. To be eligible for the current study, veterans had to be eligible for VA healthcare and currently reside in the U.S. Potential VA-eligible service members were identified in collaboration with the Defense Manpower Data Center based upon status of separation from active duty military service or return from deployment (National Guard or

Reserves). Of the 5,000 veterans identified, 72 (1.4%) were determined to be ineligible (e.g., deceased, deployed) and 924 (18.5%) surveys were undeliverable (returned to sender). Of the 4,004 surveys that were delivered, 1,161 were completed and returned, resulting in a response rate of 29%.

Procedure

A modified Dillman procedure was utilized in which all participants received a pre-alert letter, a 60-item survey package, and if needed, a follow-up letter and duplicate survey in Fall 2009 and Spring 2010 (28). Approvals for this project were obtained from both the Durham VA Medical Center Institutional Review Board and the VA Office of Management and Budget (OMB 2900-0728). Demographic characteristics and outcome variables were compared between early responders (i.e., responders to the first survey wave; $n = 978$) and late responders (second wave; $n = 183$) as a proxy for non-response bias following the continuum of resistance model (29, 30). There were no differences in the proportion of women (early = 17.0%, late = 16.5%; OR = 0.96; 95% CI, 0.63-1.47), proportion of minorities (early = 26%, late = 29%; OR = 1.18; 95% CI, 0.83-1.69), proportion of enlisted soldiers (73% vs. 79%; OR = 1.41; 95% CI, 0.96 -2.07), or proportion of veterans who served in the Reserves/National Guard during OEF/OIF (41% vs. 40%; OR = 0.96; 95% CI, 0.70-1.33) between waves. Respondents to the first wave were slightly older ($M = 39.3$, $SD = 9.9$) than late-respondents ($M = 37.6$, $SD = 9.6$), $F(1, 1153) = 4.2$, $p = .04$ and were more likely to be married (73% vs. 63%, OR = 0.64; 95% CI, 0.46-0.88, $p < .01$). Importantly, late responders did not differ from early responders in the prevalence of PTSD (OR=1.28; 95% CI, 0.83-1.98), use of VA healthcare (OR=1.08, 95% CI, 0.77-1.50), any binge drinking (OR=1.31; 95% CI, 0.91-1.88), or frequent binge drinking (OR=1.23; 95% CI, 0.83-1.82). Seventy-four cases were omitted from analyses due to missing data on the measure of alcohol use ($n = 41$), missing seven or more items on the measure of PTSD symptoms ($n = 24$), and/or missing both items on the measure of depression symptoms ($n = 37$) leaving 1,087 veterans for analyses.

Measures

Demographic Variables—Age, gender, race, employment status, self-reported income, marital status, and number of dependent children were collected. The survey also included questions on military history including unit type (Active Duty, Reserves, National Guard), branch of service, and military rank.

Trauma exposure during deployment—Combat experiences were assessed with 17 items from the Combat Experiences Scale (range 0-17, with higher scores indicating a greater number of different combat experiences (31). Two additional items measuring history of rape and sexual harassment were included to assess military sexual trauma. A total trauma score (range 0-19) was used in the analyses.

PTSD and Depressive symptoms—The posttraumatic stress disorder checklist, military version [PCL-M; (32)] was used to assess PTSD symptom severity and the presence of probable PTSD according to *DSM-IV-TR* criteria. The PCL is a widely used measure of PTSD with demonstrated reliability and validity (33). For descriptive purposes, total scores

of 50 or more were used to identify the presence of probable PTSD in respondents (33, 34). Presence of depressive symptoms was assessed with the Patient Health Questionnaire - 2 [PHQ-2(35)]. Scores from the two items were summed, and the total score was used in the logistic regressions. For descriptive purposes, total scores of 3 or more were used to identify the presence of probable depression in respondents (35, 36).

Mild Traumatic Brain Injury (mTBI)—History of deployment-related mTBI was assessed with a modified Brief Traumatic Brain Injury Screen [BTBIS; (37)]. Participants were asked if they had been injured during deployment by a blast or explosion, a bullet, a fragment or shrapnel, a fall, a vehicle accident or other means. Veterans were considered to have a probable mTBI if they endorsed an injury with any alteration of consciousness associated with the injury (e.g., losing consciousness, being dazed, confused, or seeing stars). Similar methods have been used widely in this population [e.g., (38)].

Binge Drinking—A modified version of the consumption items of the World Health Organization's Alcohol Use Disorders Identification Test [AUDIT-C; (39)] were used to assess alcohol consumption in the past year. The first item assessed the frequency of alcohol use in the past year, and response options were *never, monthly or less, two or three times a month, two or three times a week, and four or more times a week*. The second item assessed the number of drinks consumed on a typical drinking day in the past year, and response options were *1 or 2 drinks, 3 or 4 drinks, 5 or 6 drinks, 7 to 9 drinks, and 10 or more drinks*. The third item assessed the frequency with which participants consumed six or more drinks on a single occasion in the past year, and response options were *never, 1 or 2 times, 3 or 4 times, 5 or 6 times, 7 to 9 times, and 10 or more times*. Participants were classified as having engaged in “any binge drinking” if they met either or both of the following criteria: (1) reported drinking at all in the past year on the first question (i.e., did not select *never*) AND reported consuming five or more drinks on a typical occasion on the second question; or (2) reported consuming six or more drinks at least once in the past year on the third question (i.e., did not select *never*). Participants were classified as “frequent binge drinkers” if they met either or both of the following criteria: (1) reported drinking two or more times per month on the first question AND reported consuming five or more drinks on a typical occasion on the second question; or (2) reported consuming six or more drinks 10 or more times in the past year on the third question.

Provider Drinking Advice—Veterans' perception of having received provider drinking advice was assessed with a single yes or no item, “In the past 12 months has a healthcare provider advised you about your drinking (to drink less or not to drink alcohol)?”

Health Service Utilization—Use of any healthcare services was based on a single item which queried use of VA for healthcare services, use of non-VA for healthcare services, dual use (both VA and non-VA healthcare), or no healthcare use since their last deployment.

Analyses

Descriptive statistics were calculated to characterize demographic attributes of respondents. For participants missing three or fewer items on the PCL, cluster mean scores were imputed

for missing items; for participants missing one of the items on the PHQ-2, the response from the other item was imputed. Multiple imputation with ten iterations was used to impute missing demographic variables; results from the pooled data are presented. Primary analyses examined the proportion of respondents who reported regular binge drinking. Patient report of receiving risk-reduction counseling was examined for those endorsing regular binge drinking. Logistic regression analyses were used to explore demographic correlates of binge drinking and risk-reduction counseling. Given small cell sizes in some demographic variables, the following variables were dichotomized: race (White vs. Non-White), marital status (married or living together as married vs. non-married), employment status (employed full-time/Active Duty vs. other), income (< \$75,000 vs. \$75,000), military branch (Army vs. other branches), and military component (Active Duty vs. National Guard/Reserves). Combat exposure, PTSD symptoms and depression symptoms were modeled as continuous variables. All statistical analyses were performed using SPSS, Version 21.

Results

Demographic characteristics of the sample are presented in Table 1. The majority of the sample was Caucasian, male, and married. Most were working full time. Median household income of the sample was between \$60,000 and \$75,000. Sixty percent had served in OEF/OIF in Active Duty units. The majority of veterans in the sample reported exposure to combat. The average number of different combat experiences among combat exposed veterans was 4.13 ($SD = 4.03$). Mean PTSD symptom severity of the sample was 30.52 ($SD = 15.88$). The prevalence of probable PTSD in this sample was 14%, which is consistent with other studies of OEF/OIF veterans (40-42). The prevalence of deployment related mTBI observed was 12% which is consistent with other studies of OEF/OIF veterans that have used the BTBIS or similar methods (37, 38, 40).

Binge Drinking

Any binge drinking was reported by 51% ($n = 555$; 95% CI, 48%-54%) of the sample. Of those classified as engaging in binge drinking in the past year, two participants met only the first criterion described in the method section, 415 met the second criterion only, and 138 met both criteria. Seventeen percent ($n = 186$; 95% CI, 15%-19%) of the sample engaged in frequent binge drinking. Of those individuals classified as frequent binge drinkers, 46 met the first criterion only, 64 met the second criterion only, and 76 met both. The frequencies of any binge drinking and frequent binge drinking by demographic variables are summarized in Table 1. Bivariate analyses (results not shown) indicated significant associations between any binge drinking and age, gender, race, marital status, having dependent children in the home, income, military unit type, military rank, mTBI screening, number of traumatic events during deployment, PTSD severity, and depression severity. Employment status, suffering an injury during deployment, branch of service, and year of last deployment were not associated with any binge drinking in the bivariate analyses. Bivariate analyses indicated significant associations between frequent binge drinking and age, gender, race, marital status, having depending children in the home, income, military unit type, military rank, mTBI screening, number of traumatic events during deployment, and symptoms of PTSD

and depression. Frequent binge drinking was not associated with employment status, branch of service, or year of last deployment in the bivariate analyses.

To examine the unique contribution of demographic and clinical variables to binge drinking, multiple logistic regression analysis was conducted which included all demographic and military-related variables regardless of significance in the bivariate analyses. As shown in Table 2, after adjusting for all covariates, any binge drinking was uniquely associated with age, gender, race, marital status, employment status, military component, and rank. Age was negatively associated with the odds of engaging in any binge drinking. Male veterans were more likely to engage in any binge drinking compared to female veterans, and African-American and other minority veterans were less likely to engage in binge drinking compared to White veterans. Additionally, veterans who were married or living as married were less likely to report any binge drinking than those who were not; veterans who were employed full-time were more likely to engage in binge drinking than those who were not employed full-time. Veterans who served in active duty units were more likely to report binge drinking than those in Reserve or National Guard units, and officers were less likely to report binge drinking than those of enlisted ranks. PTSD symptoms and depression symptoms were not associated with any binge drinking after controlling for the covariates. Results examining frequent binge drinking (see Table 3) were similar to those examining any binge drinking in the past 12 months. Age, gender, race, marital status, military component, and military rank were significantly related to regular binge drinking; the direction of these effects was the same as in the analyses examining any binge drinking. Both depressive symptoms and PTSD symptoms were uniquely related to regular binge drinking (see Table 3). In a model examining the effect of PTSD without covarying out negative affect shared with depressive symptoms, each point on the PCL increased the risk of regular binge drinking by 4% (OR = 1.04; 95% CI, 1.02-1.05).

Use of Healthcare Services and Provider Drinking Advice

Among frequent binge drinkers ($n=186$), 75% reported use of any healthcare in the past year. Rate of provider drinking advice was assessed among frequent binge drinkers who used healthcare in the past year ($n = 139$). Two participants (both who reported using both VA and non-VA healthcare) were missing data on the item assessing provider drinking advice and were excluded from analyses, which resulted in a final sample of 137 for the analysis. Overall, 32.1% ($n = 44$) of frequent binge drinkers who used healthcare in the past year reported they had received advice about their drinking from a healthcare provider. Among frequent binge drinkers using non-VA healthcare only 13.4% ($n = 9$ of 67) reported they had received provider drinking advice, compared to 54.5% ($n = 18$ of 33) of those who only used VA healthcare and 45.9% ($n = 17$ of 37) of those who used both VA and non-VA healthcare. Among frequent binge drinkers, use of VA healthcare was significantly related to increased odds of provider advice to reduce or stop drinking. As shown in Table 4, veterans using only VA healthcare as well as those using both VA and non-VA healthcare were significantly more likely to receive risk-reduction counseling than veterans using only non-VA healthcare. Among frequent binge drinkers, the only significant predictor of the odds of receiving provider drinking advice, aside from use of VA healthcare, was depression symptoms; veterans with higher levels of depression symptoms were more likely to receive advice.

Discussion

In a regional sample of 1,087 veterans who had served in Iraq and Afghanistan, 51% reported at least one episode of binge drinking in the past 12 months and 17% of the sample reported frequent binge drinking. Only 32% of veterans who engage in frequent binge drinking and used healthcare services in the past year, however, reported that a healthcare provider had advised them to reduce their alcohol consumption. Use of VA healthcare significantly increased the odds of receiving risk-reduction counseling.

This study extends previous findings documenting high rates of binge drinking among veterans of the wars in Iraq and Afghanistan (11, 19, 40, 43). Rates of any binge drinking in the current sample were similar to those documented in the nationally representative Millennium Cohort Study in which the prevalence of any binge drinking in the past year was 53% (19). The rate of frequent binge drinking of 17% is slightly lower but comparable to studies of OEF/OIF soldiers or veterans that used competing definitions of frequent binge drinking (11, 40). For example, Calhoun and colleagues (11) reported that 23% of OEF/OIF veterans using VA health care consumed 6 or more drinks on one occasion in the past year. As many as one quarter (25.6%) of active duty OEF/OIF servicemen and women reported frequent binge drinking in an anonymous population based survey in which frequent binge drinking was defined as consuming 5 or more drinks on the same occasion at least weekly in the past month (37).

In the current study, we examined rates of binge drinking as a function of demographic variables and clinical characteristics. Demographic factors uniquely associated with binge drinking among the current sample of OEF/OIF veterans include younger age, male gender, White race, not being married, service in an active duty unit, and service in the enlisted ranks. While small effect sizes were found for demographic variables when looking at the odds of any binge drinking, a medium effect size was found for the effect of gender and rank on frequent binge drinking.

Location of healthcare was related to odds of receiving provider drinking advice among frequent binge drinkers. Specifically, the use of VA healthcare services increased the odds that frequent binge drinkers received advice to abstain or cut back on their alcohol use. Half of frequent binge drinkers using VA healthcare (either alone or in combination with non-VA healthcare) reported receipt of provider drinking advice. Although respondents were not asked about referrals to substance use treatment, the current study is consistent with other research that suggests improvement within the VA in the proportion of frequent binge drinkers who receive counseling or referral (44, 45) [c.f. (11, 14, 46)], but more research is needed to examine trends in alcohol risk-reduction counseling in VA.

The findings that PTSD symptoms were related to frequent binge drinking is consistent with previous studies that have documented an association between PTSD and alcohol misuse (15, 19, 20). While the cross-sectional design of the current survey prohibits causal inferences, results of longitudinal research have supported the hypothesis that combat veterans engage in excessive alcohol use in part to self-medicate PTSD related distress (19, 21).

The rate of probable PTSD observed in the current sample (14%) based on a PCL score 50 is comparable to at least three other large survey based studies of OEF/OIF soldiers and veterans that have used similar methods (40-42). In an anonymous population-based survey of over 7,000 active duty servicemen and women, the observed prevalence of PTSD based on the PCL 50 was 13% (40). The use of 50 as a cutting score on the PCL is relatively arbitrary given that the true population prevalence of PTSD among OEF/OIF veterans is currently unknown (33). Interview-based research with a representative population-based sample is needed to better document the actual prevalence of PTSD among OEF/OIF veterans so that PTSD screens can be better calibrated (33). In the current study, we avoided problems associated with the choice of cutting score by modeling PTSD symptoms as a continuous variable.

The prevalence of mTBI observed in the current sample (12%) is consistent with other studies of OEF/OIF veterans that have used the BTBIS or similar methods (37, 38, 40). The majority (59%) of veterans who screened positive for deployment related mTBI reported binge drinking in the past year and 26% engaged in regular binge drinking. While screening positive for mTBI was significantly related to binge drinking in bivariate analyses, mTBI was not uniquely related to binge drinking after the effects of demographic variables and PTSD and depressive symptoms were accounted for (see Tables 2 and 3). This finding is consistent with results examining mTBI and alcohol use disorders among 3,123 Iraq and Afghanistan veterans (47). It is in contrast, however, to results of the 2008 Department of Defense Survey of Health Related Behaviors among 7,155 Active Duty Personnel which found that mTBI was related to frequent binge drinking even after adjusting for demographics and positive PTSD screen (40). Given the complex and potentially self-sustaining relationship between alcohol misuse and TBI (48), further research in this area is warranted.

Several limitations of this study deserve discussion. The response rate (29%) observed in the current study is low, but is consistent with other population based, mail surveys of OEF/OIF veterans [e.g., 21.9%-33%; (11, 49-51)]. Similar surveys of OEF/OIF veterans have indicated that as many as 43% of non-returned surveys were not received (49). We did not confirm receipt of the survey materials and thus cannot be sure that all unreturned surveys reached the identified veteran which could have contributed to non-response. Concerns about potential representativeness of the sample are tempered by findings examining demographic variables, rates of PTSD, mTBI and binge drinking which are consistent with other large studies of OEF/OIF veterans (11, 19, 38, 40). Still results may not generalize to all OEF/OIF veterans.

Additionally, use of healthcare and receipt of provider drinking advice were assessed with a single item each. The current study defined frequent binge drinking as consuming five or more drinks on a typical occasion two or more times monthly or drinking six or more drinks on the same occasion ten or more times in the past year. Although rates of frequent binge drinking in the current study are consistent with previous studies (11, 19, 40), results are not directly comparable to previous work due to the use of competing definitions of binge drinking. The CDC now defines binge drinking as consuming four or more drinks on the same occasion for women and five or more drinks per occasion for men and examines

prevalence within the past 30 days (9), the National Institute on Alcohol Abuse and Alcoholism defines binge drinking as alcohol use resulting in a blood alcohol concentration of 0.08 g/dL, and the Substance Abuse and Mental Health Services Administration uses a definition of consuming five or more drinks on a single occasion at least once in the past 30 days (52). Thus, current results may underestimate the prevalence of binge drinking among women. In the future, it is important that a single definition of binge drinking be established in order to allow comparison of results between studies. After a single definition is established, more work is needed to examine binge drinking among returning veterans.

Conclusions

In sum, this study contributes to the literature documenting that binge drinking is a significant problem among returning veterans. Among OEF/OIF veterans, binge drinking is associated with PTSD symptoms and depression symptoms even after accounting for known demographic variables. The current study is the first to examine the relationship between healthcare service use and rates of provider drinking advice among veterans who engage in frequent binge drinking. Frequent binge drinkers were more likely to receive risk-reduction counseling if they were using VA healthcare services. The VA has led the nation in successfully implementing routine screening for hazardous alcohol use in primary care (26, 53). While heightened vigilance for alcohol misuse remains warranted in VA settings, current findings highlight the need for community providers to screen veterans for binge drinking and other potentially hazardous alcohol use.

Indeed, the finding of both high prevalence of binge drinking with relatively low rates of reported provider drinking advice has significant public health implications, especially among the majority of veterans who are not using VA healthcare services. Non-dependent risky drinkers account for the majority of adverse outcomes associated with alcohol use (26). Brief counseling following alcohol screening has been shown to be effective in reducing morbidity and costs associated with alcohol use, particularly among non-dependent risky drinkers (23, 54, 55). Community providers treating veterans should routinely screen for alcohol misuse in this population.

References

1. Bouchery EE, Harwood HJ, Sacks JJ, Simon CJ, Brewer RD. Economic costs of excessive alcohol consumption in the U.S. 2006 *Am J Prev Med.* 2011; 41(5):516–524. [PubMed: 22011424]
2. Mukamal KJ, Maclure M, Muller JE, Mittleman MA. Binge drinking and mortality after acute myocardial infarction. *Circulation.* 2005; 112(25):3839–3845. [PubMed: 16365208]
3. Keller S, Maddock JE, Laforge RG, Velicer WF, Basler HD. Binge drinking and health behavior in medical students. *Addict Behav.* 2007; 32(3):505–515. [PubMed: 16820268]
4. Murray RP, Connett JE, Tyas SL, Bond R, Ekuma O, Silversides CK, Barnes GE. Alcohol volume, drinking pattern, and cardiovascular disease morbidity and mortality: Is there a U-shaped function? *Am J Epidemiol.* 2002; 155(3):242–248. [PubMed: 11821249]
5. Wechsler H, Davenport A, Dowdall G, Moeykens B, Castillo S. Health and behavioral consequences of binge drinking in college. A national survey of students at 140 campuses *JAMA.* 1994; 272(21): 1672–1677. [PubMed: 7966895]
6. Wechsler H, Lee JE, Kuo M, Seibring M, Nelson TF, Lee H. Trends in college binge drinking during a period of increased prevention efforts. Findings from 4 Harvard School of Public Health College Alcohol Study surveys: 1993–2001. *J of ACH.* 2002; 50(5):203–217.

7. Wood MD, Sher KJ, McGowan AK. Collegiate alcohol involvement and role attainment in early adulthood: findings from a prospective high-risk study. *J Stud Alcohol*. 2000; 61(2):278–289. [PubMed: 10757139]
8. Maddock JE, Laforge RG, Rossi JS, O'Hare T. The College Alcohol Problems Scale. *Addict Behav*. 2001; 26(3):385–398. [PubMed: 11436930]
9. Centers for Disease Control and Prevention. Vital signs: Binge drinking prevalence, frequency, and intensity among adults - U.S., 2010. *MMWR*. 2012; 61(1):14–19. [PubMed: 22237031]
10. Burnett-Zeigler I, Ilgen M, Valenstein M, Zivin K, Gorman L, Blow A, Duffy S, Chermack S. Prevalence and correlates of alcohol misuse among returning Afghanistan and Iraq veterans. *Addict Behav*. 2011; 36(8):801–806. [PubMed: 21482030]
11. Calhoun PS, Elter JR, Jones ER, Kudler H, Straits-Troster K. Hazardous alcohol use and receipt of risk-reduction counseling among U.S. veterans of the wars in Iraq and Afghanistan. *J Clin Psychiatry*. 2008; 69(11):1686–1693. [PubMed: 19012816]
12. Erbes C, Westermeyer J, Engdahl B, Johnsen E. PTSD and service utilization in a sample of service members from Iraq and Afghanistan. *Mil Med*. 2007; 172(4):359–363. [PubMed: 17484303]
13. Grossbard JR, Hawkins EJ, Lapham GT, Williams EC, Rubinsky AD, Simpson TL, Seal KH, Kivlahan DR, Bradley KA. Follow-up care for alcohol misuse among OEF/OIF veterans with and without alcohol use disorders and posttraumatic stress disorder. *J Subst Abuse Treat*. 2013; 45(5):409–415. [PubMed: 23906670]
14. Hawkins EJ, Lapham GT, Kivlahan DR, Bradley KA. Recognition and management of alcohol misuse in OEF/OIF and other veterans in the VA: A cross sectional study. *Drug Alcohol Depend*. 2010; 109:147–153. [PubMed: 20167440]
15. Milliken CS, Auchterlonie JL, Hoge CW. Longitudinal assessment of mental health problems among active and reserve component soldiers returning from the Iraq war. *JAMA*. 2007; 298(18):2141–2148. [PubMed: 18000197]
16. Seal KH, Bertenthal D, Miner CR, Sen S, Marmar C. Bringing the war back home: Mental health disorders among 103,788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. *Arch Intern Med*. 2007; 167(5):476–482. [PubMed: 17353495]
17. Wilk JE, Bliese PD, Kim PY, Thomas JL, McGurk D, Hoge CW. Relationship of combat experiences to alcohol misuse among U.S. soldiers returning from the Iraq war. *Drug Alcohol Depend*. 2010; 108:115–112. [PubMed: 20060237]
18. McDevitt-Murphy ME, Williams JL, Bracken KL, Fields JA, Monahan CJ, Murphy JG. PTSD symptoms, hazardous drinking, and health functioning among U.S. OEF and OIF veterans presenting to primary care. *J Trauma Stress*. 2010; 23(1):108–111. [PubMed: 20104586]
19. Jacobson IG, Ryan MA, Hooper TI, Smith TC, Amoroso PJ, Boyko EJ, Gackstetter GD, Wells TS, Bell NS. Alcohol use and alcohol-related problems before and after military combat deployment. *JAMA*. 2008; 300(6):663–675. [PubMed: 18698065]
20. Jakupcak M, Tull MT, McDermott MJ, Kaysen D, Hunt S, Simpson T. PTSD symptom clusters in relationship to alcohol misuse among Iraq and Afghanistan war veterans seeking post-deployment VA health care. *Addict Behav*. 2010; 35(9):840–843. [PubMed: 20471180]
21. Hooper R, Rona RJ, Jones M, Fear NT, Hull L, Wessely S. Cigarette and alcohol use in the UK Armed Forces, and their association with combat exposures: A prospective study. *Addict Behav*. 2008; 33(8):1067–1071. [PubMed: 18485610]
22. Bray RM, Hourani LL. Substance use trends among active duty military personnel: findings from the United States Department of Defense Health Related Behavior Surveys, 1980–2005. *Addiction*. 2007; 102(7):1092–1101. [PubMed: 17567397]
23. Jonas DE, Garbutt JC, Amick HR, Brown JM, Brownley KA, Council CL, Viera AJ, Wilkins TM, Schwartz CJ, Richmond EM, Yeatts J, Evans TS, Wood SD, Harris RP. Behavioral counseling after screening for alcohol misuse in primary care: A systematic review and meta-analysis for the U.S. Preventive Services Task Force. *Ann Intern Med*. 2012; 157:645–654. [PubMed: 23007881]
24. D'Amico EJ, Paddock SM, Burnam A, Kung FY. Identification of and guidance for problem drinking by general medical providers: Results from a national survey. *Med Care*. 2005; 43(3):229–236. [PubMed: 15725979]

25. Rose HL, Miller PM, Nemeth LS, Jenkins RG, Nietert PJ, Wessell AM, Ornstein S. Alcohol screening and brief counseling in a primary care hypertensive population: A quality improvement intervention. *Addiction*. 2008; 103:1271–1280. [PubMed: 18422825]
26. Bradley KA, Williams EC, Achtmeyer CE, Volpp B, Collins BJ, Kivlahan DR. Implementation of evidence-based alcohol screening in the Veterans Health Administration. *Am J Managed Care*. 2006; 12(10):597–606.
27. Garnick DW, Horgan CM, Merrick EL, Hodgkin D, Faulkner D, Bryson S. Managed care plans' requirements for screening for alcohol, drug, and mental health problems in primary care. *Amer J Man Care*. 2002; 8(10):879–888.
28. Dillman, DA. *Mail and Internet Surveys: The Tailored Design Method -- 2007 Update with New Internet, Visual, and Mixed-Mode Guide*. 2. New York: John Wiley & Sons; 2000.
29. Lin I, Schaeffer N. Using survey participants to estimate the impact of nonparticipation. *Public Opin Q*. 1995; 59:236–258.
30. Voogt R, Saris W, Niemoller B. Non-response and the gulf between the public and politicians. *Acta Politica*. 1998; 33:250–280.
31. Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL. Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *N Engl J Med*. 2004; 351:13–22. [PubMed: 15229303]
32. Weathers, FW.; Litz, BT.; Herman, DS.; Huska, JA.; Keane, TM. *The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility*. International Society for Traumatic Stress Studies Annual Meeting; San Antonio, TX. 1993. San Antonio, TX, 1993
33. McDonald SD, Calhoun PS. The diagnostic accuracy of the PTSD Checklist: A critical review. *Clin Psychol Rev*. 2010; 30:976–987. [PubMed: 20705376]
34. Blanchard EB, Jones-Alexander J, Buckley TC, Forneris CA. Psychometric properties of the PTSD Checklist (PCL). *Behav Res Ther*. 1996; 34:669–673. [PubMed: 8870294]
35. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Med Care*. 2003; 41(11):1284–1292. [PubMed: 14583691]
36. Lowe B, Kroenke K, Grafe K. Detecting and monitoring depression with a two-item questionnaire (PHQ-2). *J Psychosom Res*. 2005; 58(2):163–171. [PubMed: 15820844]
37. Schwab KA, Baker G, Ivins B, Sluss-Tiller M, Lux W, Warden D. The Brief Traumatic Brain Injury Screen (BTBIS): Investigating the validity of a self-report instrument for detecting traumatic brain injury (TBI) in troops returning from deployment in Afghanistan and Iraq. *Neurology*. 2006; 66(5 suppl 2):A235.
38. Hoge CW, McGurk D, Thomas JL, Cox AL, Engel CC, Castro CA. Mild traumatic brain injury in U.S. soldiers returning from Iraq. *N Engl J Med*. 2008; 5:453–463.
39. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). *Arch Intern Med*. 1998; 158(16):1789–1795. [PubMed: 9738608]
40. Adams RS, Larson MJ, Corrigan JD, Horgan CM, Williams TV. Frequent binge drinking after combat-acquired traumatic brain injury among active duty military personnel with a past year combat deployment. *J Head Trauma Rehabil*. 2012; 27(5):349–360. [PubMed: 22955100]
41. Iverson KM, Pogoda TK, Gradus JL, Street AE. Deployment-related traumatic brain injury among Operation Enduring Freedom/Operation Iraqi Freedom veterans: Associations with mental and physical health by gender. *J Womens Health*. 2013; 22(3):267–275.
42. Schneiderman A, Braver ER, Kang HK. Understanding sequelae of injury mechanisms and mild traumatic brain injury incurred during the conflicts in Iraq and Afghanistan: Persistent postconcussive symptoms and posttraumatic stress disorder. *Am J Epidemiol*. 2008; 167(12): 1446–1452. [PubMed: 18424429]
43. Crawford EF, Fulton JJ, Swinkels CM, Beckham JC, VA Mid-Atlantic MIRECC OEF/OIF Registry Workgroup. Calhoun PS. Diagnostic efficiency of the AUDIT-C in U.S. veterans with military service since September 11, 2001. *Drug Alcohol Depend*. 2013; 132(1):101–106. [PubMed: 23465735]

44. Bradley KA, Lapham GT, Hawkins EJ, Achtmeyer CE, Williams EC, Thomas RM, Kivlahan DR. Quality concerns with routine alcohol screening in VA clinical settings. *J Gen Intern Med.* 2011; 26(3):299–306. [PubMed: 20859699]
45. Lapham GT, Achtmeyer CE, Williams EC, Hawkins EJ, Kivlahan DR, Bradley KA. Increased documented brief alcohol interventions with a performance measure and electronic decision support. *Med Care.* 2012; 50(2):179–187. [PubMed: 20881876]
46. Bradley KA, Epler AJ, Bush KR, Sporleder JL, Dunn CW, Cochran NE, Braddock CH, McDonell MB, Fihn SD. Alcohol-related discussions during general medicine appointments of male VA patients who screen positive for at-risk drinking. *J Gen Intern Med.* 2002; 17(5):315–326. [PubMed: 12047727]
47. Heltemes KJ, Dougherty AL, MacGregor AJ, Galarneau MR. Inpatient hospitalizations of U.S. military personnel medically evacuated from Iraq and Afghanistan with combat-related traumatic brain injury. *Mil Med.* 2011; 176(2):132–135. [PubMed: 21366072]
48. Corrigan JD, Bogner J, Hungerford DW, Schomer K. Screening and brief intervention for substance misuse among patients with traumatic brain injury. *J Trauma.* 2010; 69(3):722–726. [PubMed: 20838145]
49. Eisen SV, Schultz MR, Vogt DS, Glickman ME, Elwy AR, Drainoni ML, Osei-Bonsu PE, Martin J. Mental and physical health status and alcohol and drug use following return from deployment to Iraq and Afghanistan. *Am J Public Health.* 2012; 102(S1):S66–73. [PubMed: 22390605]
50. Vogt D, Vaughn R, Glickman ME, Schultz M, Drainoni ML, Elwy R, Eisen S. Gender differences in combat-related stressors and their association with postdeployment mental health in a nationally representative sample of U.S. OEF/OIF veterans. *J Abnorm Psychol.* 2011; 120:797–806. [PubMed: 21639595]
51. Pietrzak R, Johnson D, Goldstein M, Malley J, Rivers A, Morgan C, Southwick S. Psychosocial buffers of traumatic stress, depressive symptoms, and psychosocial difficulties in Veterans of Operations Enduring Freedom and Iraqi Freedom: The role of resilience, unit support, and postdeployment social support. *J Affect Disord.* 2010; 120(1-3):188–192. [PubMed: 19443043]
52. National Institute on Alcohol Abuse and Alcoholism. [April 2 2015] Drinking Levels Defined. <http://niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking>
53. Bradley KA, Williams EC, Achtmeyer CE, Hawkins EJ, Harris AH, Frey MS, Craig T, Kivlahan DR. Measuring performance of brief alcohol counseling in medical settings: a review of the options and lessons from the Veterans Affairs (VA) health care system. *Subst Abus.* 2007; 28:133–149. [PubMed: 18077309]
54. Fleming MF. Strategies to increase alcohol screening in health care settings. *Alcohol Health Res World.* 1997; 21(4):340–347. [PubMed: 15706746]
55. Whitlock EP, Polen MR, Green CA, Orleans T, Klein J, Force USPST. Behavioral counseling interventions in primary care to reduce risky/harmful alcohol use by adults: A summary of the evidence for the U.S. Preventive Services Task Force. *Ann Intern Med.* 2004; 140(7):557–568. [PubMed: 15068985]

Table 1

Demographic and Clinical Characteristics of Participants

Characteristic	No Binge Drinking <i>n</i> = 532		Any Binge Drinking <i>n</i> = 555		Frequent Binge Drinking <i>n</i> = 186	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age ^a	41.36	9.70	36.87	12.85	35.84	17.86
# of Traumatic Experiences During Deployment ^b	3.61	3.84	4.63	4.14	5.43	4.34
PHQ-2 Score	1.15	1.60	1.37	1.66	2.05	1.88
PCL Score	28.95	15.31	32.03	16.28	38.74	17.99
Characteristic	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Sex						
Female	110	(20.7)	76	(13.7)	14	(7.5)
Male	420	(78.9)	477	(85.9)	171	(91.9)
Missing	2	(0.4)	2	(0.4)	1	(0.5)
Race						
American Indian or Alaska Native	8	(1.5)	4	(0.7)	0	(0.0)
Asian	13	(2.4)	8	(1.4)	1	(0.5)
Black or African American	113	(21.2)	69	(12.4)	21	(11.3)
Pacific Islander	2	(0.4)	5	(0.9)	2	(1.1)
White	350	(65.8)	418	(75.3)	148	(79.6)
Other	30	(5.6)	23	(4.1)	6	(3.2)
Missing	16	(3.0)	28	(5.0)	8	(4.3)
Marital Status						
Single, never married	61	(11.5)	102	(18.4)	40	(21.5)
Married or living together as married	398	(74.8)	366	(65.9)	110	(59.1)
Divorced or Separated	64	(12.0)	83	(15.0)	33	(17.7)
Widowed	2	(0.4)	1	(0.2)	1	(0.5)
Missing	7	(1.3)	3	(0.5)	2	(1.1)

	No Binge Drinking n = 532	Any Binge Drinking n = 555	Frequent Binge Drinking n = 186
Dependent children in household	353 (66.4)	330 (59.5)	102 (56.0)
Missing	6 (1.1)	10 (1.8)	4 (2.2)
Household income			
< \$20,000	52 (9.8)	52 (9.4)	27 (14.5)
\$20,000-49,999	109 (20.5)	166 (29.9)	61 (32.8)
\$50,000-74,999	121 (22.7)	113 (20.4)	34 (18.3)
\$75,000-99,999	86 (16.2)	87 (15.7)	23 (12.4)
\$100,000	155 (29.1)	127 (22.9)	39 (21.0)
Missing	9 (1.7)	10 (1.8)	2 (1.1)
Employment status ^c			
Active duty	62 (11.7)	68 (12.3)	16 (8.6)
Employed full time	334 (62.8)	351 (63.2)	115 (61.8)
Employed part time	28 (5.3)	24 (4.3)	8 (4.3)
Unemployed	66 (12.4)	64 (11.5)	31 (16.7)
Retired	75 (14.1)	50 (9.0)	10 (5.4)
Disabled	28 (5.3)	23 (4.1)	9 (4.8)
Student	48 (9.0)	72 (13.0)	28 (15.1)
Homemaker	25 (4.7)	15 (2.7)	4 (2.3)
Missing	2 (0.4)	2 (0.4)	1 (0.5)
Military Branch			
Air Force	94 (17.7)	65 (11.7)	20 (10.8)
Army	255 (47.9)	270 (48.6)	87 (46.8)
Coast Guard	1 (0.2)	0 (0.0)	0 (0.0)
Marines	57 (10.7)	87 (15.7)	37 (19.9)
Navy	114 (21.4)	123 (22.2)	39 (21.0)
Missing	11 (2.1)	10 (1.8)	3 (1.6)
Type of Military Service			
Regular Active Duty	299 (56.2)	359 (64.7)	130 (69.9)

	No Binge Drinking <i>n</i> = 532	Any Binge Drinking <i>n</i> = 555	Frequent Binge Drinking <i>n</i> = 186
Reserves or National Guard	220 (41.4)	183 (33.0)	55 (29.6)
Missing	13 (2.4)	13 (2.3)	1 (0.5)
Military Rank			
Enlisted	363 (68.2)	440 (79.3)	164 (88.6)
Officer	163 (30.6)	113 (20.4)	21 (11.3)
Missing	6 (1.1)	2 (0.4)	1 (0.5)
Military Trauma Exposure^d			
Exposed to Combat	383 (72.0)	431 (77.7)	156 (83.9)
Military Sexual Trauma	17 (3.2)	15 (2.7)	3 (1.6)
Missing	11 (2.1)	11 (2.0)	2 (1.1)
Injured on Deployment			
	181 (34.0)	206 (37.1)	80 (43.0)
Missing	11 (2.1)	14 (2.5)	8 (4.3)
Year Last Deployment Ended			
2001	6 (1.1)	13 (2.3)	7 (3.8)
2002	25 (4.7)	31 (5.6)	11 (5.9)
2003	107 (20.1)	90 (16.2)	27 (14.5)
2004	87 (16.4)	87 (15.7)	29 (15.6)
2005	89 (16.7)	101 (18.2)	31 (16.7)
2006	77 (14.5)	87 (15.7)	34 (18.3)
2007	58 (10.9)	56 (10.1)	18 (9.7)
2008 or later	74 (13.9)	77 (13.9)	27 (14.5)
Missing	9 (1.7)	13 (2.3)	2 (1.1)
Use of Healthcare Services			
No use	98 (18.4)	112 (20.2)	39 (21.0)
Use Non-VA Services Only	221 (41.5)	236 (42.5)	67 (36.0)
Use VA Services Only	96 (18.0)	87 (15.7)	33 (17.7)
Dual Use (VA and Non-VA services)	102 (19.2)	96 (17.3)	39 (21.0)
Missing	15 (2.8)	24 (4.3)	8 (4.3)

	No Binge Drinking <i>n</i> = 532	Any Binge Drinking <i>n</i> = 555	Frequent Binge Drinking <i>n</i> = 186
Depression (3 on PHQ-2)	83 (15.6)	103 (18.6)	58 (31.2)
PTSD (50 on PCL)	67 (12.6)	85 (15.3)	48 (25.8)
mTBI	52 (9.8)	76 (13.7)	33 (17.7)

^a 4 participants were missing age.

^b 22 participants were missing number of traumatic events.

^c Participants could select multiple options for this question.

^d Participants who experienced both combat and MST are included in both counts.

Table 2
Fully Adjusted Multivariate Logistic Regression Model for Any Binge Drinking ($n = 1,087$)

Characteristic	<i>b</i>	OR	95% CI for OR
Age	-0.04	0.96 ^{***}	(0.95 – 0.98)
Male	0.60	1.83 ^{**}	(1.28 – 2.61)
White	0.54	1.72 ^{***}	(1.27 – 2.32)
Married or Living Together	-0.37	0.69 [*]	(0.50 – 0.95)
Dependent Children	-0.20	0.82	(0.62 – 1.09)
High Income	0.08	1.08	(0.79 – 1.48)
Employed	0.34	1.40 [*]	(1.02 – 1.92)
Army	0.04	1.04	(0.78 – 1.38)
Active Duty	0.32	1.38 [*]	(1.02 – 1.87)
Year of Last Deployment	-0.01	0.99	(0.92 – 1.06)
Officer	-0.45	0.64 ^{**}	(0.46 – 0.90)
Injury during OEF/OIF	0.00	1.00	(0.73 – 1.38)
Total Trauma Experiences	0.03	1.03	(0.99 – 1.07)
Depression Symptoms	0.01	1.01	(0.91 – 1.13)
PTSD Symptoms	0.01	1.01	(0.99 – 1.02)
mTBI screen	-0.05	1.32	(0.59 – 1.52)

Note. OR = Odds Ratio; CI = Confidence Interval

* $p < .05$;

** $p < .01$,

*** $p < .001$

Table 3
Fully Adjusted Multivariate Logistic Regression Model for Frequent Binge Drinking ($n = 1,087$)

Characteristic	<i>b</i>	OR	95% CI for OR
Age	-0.02	0.98 [*]	(0.96 – 1.00)
Male	1.17	3.23 ^{***}	(1.75 – 5.95)
White	0.67	1.96 ^{**}	(1.23 – 3.13)
Married or Living Together	-0.41	0.67 [*]	(0.45 – 0.99)
Dependent Children	-0.34	0.71	(0.49 – 1.04)
High Income	0.27	1.31	(0.85 – 2.01)
Employed	0.17	1.18	(0.78 – 1.79)
Army	-0.10	0.91	(0.61 – 1.33)
Active Duty	0.45	1.57 [*]	(1.03 – 2.39)
Year of Last Deployment	0.05	1.05	(0.95 – 1.16)
Officer	-0.94	0.39 ^{**}	(0.23 – 0.68)
Injury during OEF/OIF	0.03	1.03	(0.67 – 1.58)
Total Trauma Experiences	0.02	1.02	(0.97 – 1.07)
Depression Symptoms	0.16	1.18 [*]	(1.03 – 1.35)
PTSD Symptoms	0.02	1.02 ^{**}	(1.01 – 1.04)
mTBI screen	-0.31	0.73	(0.41 – 1.30)

Note. OR = Odds Ratio; CI = Confidence Interval

^{*}
 $p < .05$;

^{**}
 $p < .01$,

^{***}
 $p < .001$

Table 4
Fully Adjusted Multivariate Logistic Regression Model for Receipt of Risk-reduction
Counseling Among Regular Binge Drinkers who Used Healthcare in the Past 12 Months
(n = 137)

Characteristic	<i>b</i>	OR	95% CI for OR
Age	0.04	1.04	(0.98 – 1.10)
Male	0.20	1.23	(0.12 – 12.09)
White	-1.27	0.28	(0.07 – 1.23)
Married or Living Together	-0.25	0.78	(0.29 – 2.12)
Dependent Children	-0.37	0.69	(0.23 – 2.04)
High Income	-1.47	0.23	(0.05 – 1.03)
Employed	0.12	1.12	(0.37 – 3.40)
Army	-0.32	0.73	(0.26 – 2.08)
Active Duty	-0.19	0.83	(0.24 – 2.90)
Year of Last Deployment	0.17	1.18	(0.89 – 1.56)
Officer	0.71	2.03	(0.23 – 17.81)
Injury during OEF/OIF	0.59	1.80	(0.49 – 6.64)
Total Trauma Experiences	-0.04	0.96	(0.83 – 1.11)
Depression Symptoms	0.44	1.55*	(1.05 – 2.28)
PTSD Symptoms	-0.01	0.99	(0.95 – 1.04)
mTBI screen	0.98	2.66	(0.59 – 12.06)
Use of Healthcare Services			
Non-VA Healthcare Only	--		
VA Healthcare Only	1.95	7.05**	(1.96 – 25.36)
Both VA and Non-VA Healthcare	1.44	4.23*	(1.23 – 14.50)

Note. OR = Odds Ratio; CI = Confidence Interval

* $p < .05$;

** $p < .01$,

*** $p < .001$