Published in final edited form as:

Subst Use Misuse. 2018 April 16; 53(5): 800–807. doi:10.1080/10826084.2017.1385632.

Alcohol Misuse in Reserve Soldiers and their Partners: Cross-Spouse Effects of Deployment and Combat Exposure

Bonnie M. Vest, PhD¹, Sarah Cercone Heavey, PhD, MPH², D. Lynn Homish, BS², and Gregory G. Homish, PhD^{1,2}

¹Department of Family Medicine, University at Buffalo, Buffalo NY

²Department of Community Health & Health Behavior, University at Buffalo, Buffalo NY

Abstract

Background—Military deployment and combat are associated with worse outcomes, including alcohol misuse. Less is known about how these experiences affect soldiers' spouses.

Objective—The study objective was to explore relationships between deployment, combat exposure, and alcohol misuse; especially cross-spouse effects (effect of one partner's experiences/behavior on the other partner), which has been under-examined in military samples.

Methods—US Army Reserve/National Guard soldiers and their partners completed a questionnaire covering physical and mental health, military service and substance use. Negative binomial regression models examined number of deployments and combat exposure individually for alcohol misuse and frequent heavy drinking (FHD). In additional models, we examined combat exposure's role on alcohol outcomes, controlling for the soldiers' number of deployments, PTSD symptoms, age, and in cross-spouse models, alcohol use and FHD. We considered individuals' deployment experiences related to their alcohol outcomes and to their spouses' alcohol outcomes.

Results—The study sample included male soldiers with current/lifetime military service (n=248) and their female partners. Combat exposure was related to FHD (RR: 1.01, p<0.05, 95% CI: 1.01, 1.01) among male soldiers while controlling for PTSD symptoms, number of deployments, and age. Female partners of male soldiers were more likely engage in FHD (RR: 1.01, p<0.05, 95% CI: 1.01, 1.01) if their spouse experienced combat.

Conclusions—Our results demonstrate that male soldiers and their spouses are at increased risk of FHD if the soldier experienced combat. This points to the need for better screening, particularly of spouses of soldiers, whose alcohol misuse may be overlooked.

Keywords

alcohol misuse; frequent heavy drinking; military personnel; deployment; spouses

Corresponding Author: Bonnie M. Vest, PhD, Department of Family Medicine, 77 Goodell Street, Suite 220, Buffalo, NY 14203, (T) 716-816-7287, (F) 716-845-6899, bvest@buffalo.edu.

Portions of this work were presented at the 38th Annual Meeting of the Research Society on Alcoholism, San Antonio, TX, June 2015.

Declaration of Interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Compared to civilian populations, military service members and veterans are at increased risk for a range of mental health and substance use problems (Bray, Brown, & Williams, 2013; Green, Beckham, Youssef, & Elbogen, 2014; Jacobson et al., 2008; Milliken, Auchterlonie, & Hoge, 2007). Rates of hazardous alcohol use in military populations, particularly among deployed soldiers are high (Sundin et al., 2014). Studies of veterans and/or service members have found varied rates of alcohol abuse ranging from 10% (Seal et al., 2011) to 39% (Eisen et al., 2012). Population level evidence from 2008 in active duty populations across all branches found heavy alcohol use among 20% of the population and rates of binge drinking around 47%, with increasing rates of both problems in the last decade (Bray et al., 2013). Individuals who had experienced combat exposure had higher rates of both heavy and binge drinking (Bray et al., 2013). Much of the research to date has examined the varying complexities of the relationship between combat experiences, post-traumatic stress disorder (PTSD) and alcohol misuse, given the strong link between both traumatic experiences and PTSD, and PTSD and alcohol use (Debell et al., 2014; Jakupcak et al., 2010; Schumm & Chard, 2012).

Reserve and National Guard populations may be at increased risk for a range of mental health problems, including experiencing higher rates of alcohol misuse, compared to active duty soldiers (Cohen, Fink, Sampson, & Galea, 2015; Griffith, 2010; Milliken et al., 2007). Prevalence rates of alcohol related problems among deployed National Guard (NG) and reserve soldiers vary across studies (Cohen et al., 2015), likely due to the use of different subsets of the population and different measures of alcohol misuse. Jacobsen et al. reported that NG and reserve soldiers who deploy and experience combat had a prevalence of alcohol related problems of 15% and rates of binge drinking of 54% (Jacobson et al., 2008). Another study found that 13% of reserve and NG soldiers screened positive for alcohol use disorders (AUDs), 38% of which were new onset since deployment (Kehle et al., 2012). Consistent with these ranges, population level data from 2006, found that 14% of reserve component soldiers experienced heavy alcohol use, and 38% engaged in heavy episodic drinking (Brown, Williams, Bray, & Hourani, 2012).

In spite of the high prevalence of alcohol misuse, it is less understood how specific aspects of military service and mental health conditions, such as PTSD, contribute to this misuse (Kline et al., 2014). Recent work has begun to examine the impact of different aspects of deployment (e.g. total number or length) and various levels of combat experiences (e.g., amount of exposure) in order to further explore factors that lead to adverse outcomes (Kline et al., 2014; Maguen et al., 2010; Maguen et al., 2011; Spera, Thomas, Barlas, Szoc, & Cambridge, 2011). For example, Spera and colleagues (Spera et al., 2011) examined the various aspects of deployment (e.g. frequency or duration) and combat exposure (e.g. direct vs. indirect) in relation to alcohol use among Air Force members. They found that more deployments (each additional deployment results in a 17% increase in odds of developing an AUD) and longer duration of deployment (each additional year of deployment results in a 23% increase in odds) were associated with greater risk for alcohol use disorders (AUD) and the aggregate length of time spent on deployment had the biggest impact on drinking (Spera et al., 2011). Kline and colleagues (Kline et al., 2014) found that, independent of PTSD, combat exposure contributes to alcohol dependence in National Guard soldiers, such that increases in combat exposure resulted in a 9% increase in the risk for alcohol dependence,

and in soldiers without PTSD, this risk increased to 17%. However, in another study of primarily reserve and National Guard soldiers (74% reserve or NG), alcohol use was not associated with either combat experience or perceptions of threat (James, Van Kampen, Miller, & Engdahl, 2013). These discrepancies suggest the need for additional studies examining the complexities of the relationship between deployment-related factors, mental health, and alcohol misuse.

Research has demonstrated that military spouses are also at increased risk of psychological problems, particularly related to longer deployments and the soldier's PTSD (de Burgh, White, Fear, & Iversen, 2011). However, less is known about factors contributing to substance use among spouses of soldiers. Although rates of alcohol problems among military spouses have been found to be much lower than those for soldiers, (Ahmadi & Green, 2011) spouses of soldiers may still be at increased risk in certain circumstances. Nationally representative data indicate that 31.5% of military spouses reported past month binge drinking, and that these rates were higher than those for all married women (Lipari, Forsyth, Bose, Kroutil, & Lane, 2016). Smaller studies have found that 4% of primary-care seeking spouses of active duty Army members reported using alcohol more than they meant to and 3% felt the need to cut down on their drinking (Eaton et al., 2008) and similar rates have also been found among National Guard spouses (Gorman, Blow, Ames, & Reed, 2011). A recent study of 661 National Guard couples, conducted during the period from 45-90 days after returning from deployment found that nearly 11% of NG spouses met criteria for hazardous alcohol use (Blow et al., 2013). Couples where one or both partners were positive for hazardous drinking experienced greater levels of family distress (Blow et al., 2013). Another study focused on National Guard soldiers and their spouses found that a small percentage of spouses engaged in alcohol misuse post-deployment, and determined this was unrelated to their partners' alcohol use (Erbes, Kramer, Arbisi, DeGarmo, & Polusny, 2017). The authors hypothesized that spouses' alcohol misuse was related to lower levels of family readiness and reactivity to stress in the relationship and the deployment (Erbes et al., 2017). In spite of this work however, it remains unclear precisely which aspects of the military family experience play a key role in spouses' risk of alcohol problems.

It has been well-established in civilian populations that one spouse's behavior and substance use affects substance use and mental health outcomes in their partner (cross-spouse effects). Previous research has demonstrated these cross-spouse effects across multiple conditions, including smoking (Homish & Leonard, 2005; Manchon Walsh et al., 2007), general health behaviors such as exercise and healthy eating (Bove, Sobal, & Rauschenbach, 2003; Homish & Leonard, 2008), and non-medical use of prescription drugs (Homish, Leonard, & Cornelius, 2010). Husband's alcohol problems that were related to the marriage have been associated with higher levels of depression in wives (Homish, Leonard, & Kearns-Bodkin, 2006), and higher levels of marital satisfaction have been found to be protective against subsequent alcohol problems for both husbands and wives (Leonard & Homish, 2008). However, to our knowledge there has been little examination of these types of partner effects in military populations.

Given the identified gaps in the literature, the goal of the current study was to identify the role of multiple deployments and combat exposure on soldier and spousal alcohol misuse.

We were especially interested in the cross-spouse effects, due to the limited exploration of these issues in military samples. We hypothesized that a greater number of deployments and combat exposure would be significantly associated with alcohol misuse and frequent heavy drinking (FHD). We further hypothesized that a soldier's deployment and combat exposure would increase the likelihood of the partner's alcohol misuse and FHD. Additionally, we hypothesized that combat exposure would remain significantly associated with alcohol misuse and FHD even after controlling for the soldier's deployments, PTSD symptoms, age, and in cross-spouse models, alcohol misuse and frequent heavy drinking.

METHODS

This work is a part of an ongoing longitudinal study, Operation: SAFETY (Soldiers and Families Excelling Through the Years), that is broadly focused on the health of NG/reserve soldiers and their spouses (Devonish et al., 2017; Heavey, Homish, Goodell, & Homish, 2017; Vest, Heavey, Homish, & Homish, 2017).

Recruitment

The Operation: SAFETY study recruited US Army Reserve and Army National Guard soldiers and their partners over a 15 month period (Summer 2014 – Fall 2015). The protocol was approved by the University at Buffalo's Institutional Review Board and by the Army Human Research Protections Office, the Adjutant General of the National Guard, and the Office of the Chief, Army Reserve. Research staff made arrangements with unit commanders to attend drills throughout the upstate New York region. At the drills, soldiers were given a 10-minute overview of the project, explaining the project goal of exploring how the health and well-being of reserve soldiers and their partners may impact each other's physical and mental well-being. Soldiers were told the questionnaire covered a variety of general health topics such as physical and mental health, military service and deployment information, caffeine intake, sleep, substance use, romantic relationship, and social network. Confidentiality procedures were discussed, including the assurance that the military would not know who participated and that their partner would not learn of their responses. After the briefing and once all questions were answered, soldiers were invited to complete a brief, one page screening form. All soldiers were provided an information packet to take home and share with their partner. Partners and soldiers who missed the briefing were able to reach the study through phone and web for screening.

Potential participants were screened on six inclusion criteria: (1) married or living as if married; (2) one member is a current Army Reserve Soldier or National Guard Soldier; (3) the soldier is between the ages of 18 and 45; (4) both partners speak and understand English; (5) both partners are willing and able to participate; and (6) both partners have had at least one alcoholic beverage in the past year.

We met with 47 units across New York State. 731 potential participants were eligible for the study. Of those, 572 (78%) agreed to participate and 83% of couples (N=472) completed some part of the survey. Only surveys where both partners completed the entire survey were included (N=411). We examined differences on the screening form items (i.e. the six inclusion criteria), plus additional preventive health items assessed on the screener that were

not used in selection criteria (e.g. having a routine physical, exercise frequency, and eating fast food) between those that passed and enrolled vs those who passed and did not enroll. Couples where a civilian partner screened for the study ($n=11$) were less likely to enroll ($p<.001$). No other significant differences were found. No differences existed between inclusion criteria or the preventive health variables between those who enrolled and completed the survey vs those who enrolled and did not complete.

Participants

The sample for the present work is composed of a subsample of the full study: males who are currently serving in the military or have ever served and have experienced at least one combat deployment ($n=248$) and their female partners. The majority of the sample is non-Hispanic White (males: 81%; females: 89%), with at least some college education (males: 60%; females: 42%) or a college degree (males: 26%; females: 48%). The average income bracket is \$60,000-79,000. The average age of participants was 33.4 (standard deviation (sd) = 6.2) years for males and 32.0 (sd = 6.5) years for females. Most participants were married (75%), with the remainder living as if married (i.e. cohabitating) (Table 1). Individuals who are married and living as if married were included in the analysis as one group, and are referred to as spouses in the remainder of the discussion.

Survey Administration

The surveys were administered through a secure HIPAA-compliant online survey programming software, StudyTrax™ which allowed for data encryption. Participants who lived in the local area were invited to the university to complete their surveys. Partners could come in together or separately, and were each given a private room with a touchscreen computer on which to complete their survey. Informed consent was conducted with a research staff member. For soldiers and partners outside of the local area, separate login information was sent to each partners' email and the consent process was completed electronically. Participants each received \$60 for their time in the first survey (\$120 per couple), and \$70 (\$140 per couple) for each of the two follow-ups.

Measures

Alcohol Misuse—Alcohol misuse was assessed with the AUDIT (Alcohol Use Disorders Identification Test) (Babor & Del Boca, 1992). The AUDIT consists of 10 items rated on a 4-point scale from 0 (Never) to 4 (Daily or almost daily), with scores ranging from 0-40. Items include things such as, “Have you or someone else been injured because of your drinking?”, and “How often during the last year have you had a feeling of guilt or remorse after drinking?” Total scores were calculated for each individual and entered as a continuous variable in the regression model (alphas: .76 males; .80 females).

Frequent Heavy Drinking—Consistent with other work (Homish & Leonard, 2007), frequent heavy drinking was assessed using the maximum report of two items: 1) the reported frequency of getting drunk in the past year, ranging on a 9-point scale from never to every day in the past year, and 2) the frequency of five or more (for males) or four or more (for females) drinks in a single setting, ranging on a 9-point scale from never to every day in the past year.

Combat Exposure—Combat exposure was assessed with the Combat Experiences Scale from the Deployment Risk and Resilience Inventory-2 (DRRI-2) (Vogt, Smith, King, & King, 2012). Participants reported on the frequency with which they encountered 17 objective events and circumstances occurring in their *most recent* deployment, ranging from 1 (Never) to 6 (Daily or almost daily). Items include things such as, “I personally witnessed enemy combatants being seriously wounded or killed,” “I was exposed to hostile incoming fire,” and “I fired my weapon at enemy combatants.” Scores range from 17-102 with higher scores indicating greater combat exposure (alphas: .94 males; .90 females).

Posttraumatic Stress Disorder—PTSD symptoms were measured using the PTSD Checklist (PCL-5), based upon DSM-5 criteria (Bovin et al., 2015). This is a 20-item self-report measure of PTSD symptoms over the past month. Each response is rated on a 5-point Likert-type scale ranging from 0 (*Not at all*) to 4 (*Extremely*), with an overall range of 0-80. Greater scores indicate greater severity of PTSD. It has demonstrated good psychometric properties in previous research (Bovin et al., 2015), and internal consistency in the present sample was high (alphas = .95 males and females).

Deployment Characteristics—Deployment frequency was assessed with one question, asking participants how many times they have been deployed in total. Responses were dichotomized into one deployment vs two or more.

Age—Participant’s age was calculated from subtracting their reported date of birth from the date of survey completion.

Analysis

Descriptive statistics were used to characterize the sample. Negative binomial regression models examined each predictor (one vs more than one deployment, and combat exposure) individually for each dependent variable (frequency of heavy drinking and alcohol misuse). Additionally, adjusted models controlling for the soldier’s age, PTSD symptoms, multiple deployments, and in cross-spouse models, the soldier’s alcohol problems and frequent heavy drinking, were examined with each dependent variable. Negative binomial regression was selected because of its ability to handle discrete data with overdispersion (Byers, Allore, Gill, & Peduzzi, 2003). Importantly, we considered within spouse effects (i.e., husbands’ deployment related to his alcohol outcomes) and cross spouse effects models (i.e., husbands’ deployment related to wives’ alcohol outcomes).

RESULTS

Descriptive Results

On average, male soldiers had 11.9 years of service (sd = 5.9) and 1.6 deployments (sd = 0.9) with an average combat exposure score of 32.2 (sd = 16.5). Male soldiers had mean rates of PTSD symptoms of 10.4 (sd=11.8)

Mean rates of alcohol misuse in our study were 5.1 (sd = 4.0) for male soldiers and 2.2 (sd = 1.2) for their partner. The prevalence of alcohol misuse (AUDIT score ≥ 8) in this sample was 19.0% of male soldiers (n=47) and 9.7% of their partners (n=24). Male soldiers drank

heavily once per month, on average, while their partners drank heavily a few times per year, on average.

Regression Models

Within Spouse Effects—A greater number of deployments was not associated with increases in alcohol misuse or frequent heavy drinking (Table 2). Combat exposure was associated with both alcohol misuse (Risk Ratio [RR]:1.01, $p<0.05$, 95% CI: 1.01, 1.01) and frequent heavy drinking (RR:1.01, $p<0.05$, 95% CI: 1.01, 1.01). There was no association between combat exposure and alcohol problems in adjusted models controlling for his age and PTSD. However, combat exposure was significantly related to his frequent heavy drinking (RR: 1.01, $p<.05$, 95% CI: 1.01, 1.01) after controlling for his age, number of deployments, and PTSD symptoms (Table 3).

Cross Spouse Effects—Number of deployments was not associated with any female spouse outcomes. Male soldiers' combat exposure was associated with his spouse's frequent heavy drinking (RR: 1.01, $p<0.01$, 95% CI: 1.01, 1.01) (Table 2). This association remained significant (RR: 1.01, $p<.05$, 95% CI: 1.01, 1.01) after controlling for soldiers' age, number of deployments, PTSD symptoms, and his frequent heavy drinking (Table 3). There were no associations between his combat exposure and her alcohol problems.

DISCUSSION

Our results demonstrate that combat exposure is associated with increased risk of frequent heavy drinking, both in soldiers *and* their spouses, even after controlling for the total number of deployments, age, PTSD, and in cross-spouse models, the soldier's own frequent heavy drinking. Similar to Spera et al., our results show that the total number of deployments is not related to alcohol problems (Spera et al., 2011). This indicates that deploying multiple times does not necessarily place someone at greater risk for alcohol misuse. This may, in part, be a result of the "healthy warrior effect," where individuals who are vulnerable to mental health and substance use problems may be "screened out" in training and initial deployments and therefore not experience multiple deployments (Haley, 1998; Larson, Highfill-McRoy, & Booth-Kewley, 2008). It may also be that examining the number of deployments alone is not a sufficient indicator of potential future problems, and rather the amount of cumulative time spent on deployment (Spera et al., 2011) and the experiences encountered *during* deployment, such as combat exposure, may play a greater role in determining risk of alcohol misuse and frequent heavy drinking. It may be that the total number of combat deployments, rather than overall deployments, is more significant for determining outcomes, but our data did not allow for this comparison to be made. Our work confirms that of Kline and colleagues (Kline et al., 2014), demonstrating that combat exposure in and of itself, is related to alcohol problems, rather than being mediated by PTSD. Future work should consider differentiating between different types of deployments.

Further, our results demonstrate that female spouses of male National Guard and reserve soldiers are more likely to engage in frequent heavy drinking if their spouse was exposed to combat during their deployment. The total number of deployments did not show the same effect. Significantly, the soldier's combat exposure was related to the spouse's frequent

heavy drinking even after controlling for the soldier's own frequent heavy drinking. While we know that one spouse's substance use behaviors often influence those of their partner, our findings indicate that a soldier's combat exposure may independently impact their spouse's alcohol misuse. It might be that female spouses engage in alcohol use to cope with stress related to changes in their spouse as a result of his combat experience. The stress of knowing the soldier is in a combat environment and/or hearing stories about those experiences may also contribute to the spouse's alcohol use. Further study is warranted to understand the mechanisms underlying the relationship between combat exposure and alcohol misuse experienced by the soldier's spouse. This is a significant finding of this study, which adds to our understanding of the effects of military service on family units.

Limitations

The data presented here are subject to a few limitations. First, all data are self-reported by participants and alcohol problems were not clinically-verified. However, this method is standard for collecting this type of information, and we use well-validated tools for assessing problematic alcohol use. Second, these results represent cross-sectional data from an ongoing longitudinal study and therefore causal relationships cannot be explored. Additional years of data may shed new light on baseline trends. Longitudinal data collected in future phases of this project will allow us to monitor alcohol usage over time and potentially compare pre and post deployment rates for soldiers who deploy during the study period and their spouses.

Conclusions

Overall, our results demonstrate that both male soldiers and their female spouses are at increased risk of frequent heavy drinking if the male soldier experienced combat during his deployment. This indicates the need for better screening, particularly of female spouses, whose alcohol misuse may be overlooked. These spouses are also likely seeking health care in civilian settings (Eaton et al., 2008). Healthcare providers should consider asking patients about their partner's military status and deployment and consider screening for alcohol misuse. Future studies should further explore the effect of soldiers' military experiences on their partner's mental, physical health and substance use outcomes and explore the mechanisms that underlie these relationships.

Acknowledgments

Funding Statement:

Research reported in this publication was supported by the National Institute on Drug Abuse of the National Institutes of Health under award number R01DA034072 (GGH). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

- Ahmadi H, Green SL. Screening, brief intervention, and referral to treatment for military spouses experiencing alcohol and substance use disorders: a literature review. *Journal of Clinical Psychology in Medical Settings*. 2011; 18:129–136. DOI: 10.1007/s10880-011-9234-7 [PubMed: 21626357]

- Babor, TF., Del Boca, FK. Just the facts: Enhancing measurement of alcohol consumption using self-report methods. In: Litten, RZ., Allen, JP., editors. *Measuring alcohol consumption : psychosocial and biochemical methods*. Totowa, NJ: Humana Press; 1992. p. 3-20.
- Blow AJ, Gorman L, Ganoczy D, Kees M, Kashy DA, Valenstein M, Chermack S, et al. Hazardous drinking and family functioning in National Guard veterans and spouses postdeployment. *Journal of Family Psychology*. 2013; 27:303–313. DOI: 10.1037/a0031881 [PubMed: 23544925]
- Bove CF, Sobal J, Rauschenbach BS. Food choices among newly married couples: convergence, conflict, individualism, and projects. *Appetite*. 2003; 40:25–41. [PubMed: 12631502]
- Bovin MJ, Marx BP, Weathers FW, Gallagher MW, Rodriguez P, Schnurr PP, Keane TM. Psychometric properties of the PTSD checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in Veterans. *Psychological Assessment*. 2015; 28:1379–1391. DOI: 10.1037/pas0000254 [PubMed: 26653052]
- Bray RM, Brown JM, Williams J. Trends in binge and heavy drinking, alcohol-related problems, and combat exposure in the U S military. *Substance Use & Misuse*. 2013; 48:799–810. DOI: 10.3109/10826084.2013.796990 [PubMed: 23869454]
- Brown JM, Williams J, Bray RM, Hourani L. Postdeployment alcohol use, aggression, and post-traumatic stress disorder. *Military Medicine*. 2012; 177:1184–1190. [PubMed: 23113445]
- Byers AL, Allore H, Gill TM, Peduzzi PN. Application of negative binomial modeling for discrete outcomes: A case study in aging research. *Journal of Clinical Epidemiology*. 2003; 56:559–564. [PubMed: 12873651]
- Cohen GH, Fink DS, Sampson L, Galea S. Mental health among reserve component military service members and veterans. *Epidemiological Reviews*. 2015; 37:7–22. DOI: 10.1093/epirev/mxu007
- de Burgh HT, White CJ, Fear NT, Iversen AC. The impact of deployment to Iraq or Afghanistan on partners and wives of military personnel. *International Review of Psychiatry*. 2011; 23:192–200. DOI: 10.3109/09540261.2011.560144 [PubMed: 21521089]
- Debell F, Fear NT, Head M, Batt-Rawden S, Greenberg N, Wessely S, Goodwin L. A systematic review of the comorbidity between PTSD and alcohol misuse. *Social Psychiatry and Psychiatric Epidemiology*. 2014; 49:1401–1425. DOI: 10.1007/s00127-014-0855-7 [PubMed: 24643298]
- Devonish JA, Homish DL, Vest BM, Daws RC, Hoopsick RA, Homish GG. The impact of military service and traumatic brain injury on the substance use norms of Army Reserve and National Guard Soldiers and their spouses. *Addictive Behaviors*. 2017; 72:51–56. [PubMed: 28388492]
- Eaton KM, Hoge CW, Messer SC, Whitt AA, Cabrera OA, McGurk D, Castro CA, et al. Prevalence of mental health problems, treatment need, and barriers to care among primary care-seeking spouses of military service members involved in Iraq and Afghanistan deployments. *Military Medicine*. 2008; 173:1051–1056. [PubMed: 19055177]
- Eisen SV, Schultz MR, Vogt D, Glickman ME, Elwy AR, Drainoni M-L, Martin J, et al. Mental and physical health status and alcohol and drug use following return from deployment to Iraq or Afghanistan. *American Journal of Public Health*. 2012; 102(Suppl 1):S66–73. [PubMed: 22390605]
- Erbes CR, Kramer M, Arbisi PA, DeGarmo D, Polusny MA. Characterizing spouse/partner depression and alcohol problems over the course of military deployment. *Journal of Consulting and Clinical Psychology*. 2017; 85:297–308. DOI: 10.1037/ccp0000190 [PubMed: 28333532]
- Gorman LA, Blow AJ, Ames BD, Reed PL. National Guard families after combat: Mental health, use of mental health services, and perceived treatment barriers. *Psychiatric Services*. 2011; 62:28–34. DOI: 10.1176/appi.ps.62.1.28 [PubMed: 21209296]
- Green KT, Beckham JC, Youssef N, Elbogen EB. Alcohol misuse and psychological resilience among U.S. Iraq and Afghanistan era veterans. *Addictive Behaviors*. 2014; 39:406–413. DOI: 10.1016/j.addbeh.2013.08.024 [PubMed: 24090625]
- Griffith J. Citizens coping as soldiers: A review of deployment stress symptoms among reservists. *Military Psychology*. 2010; 22:176–206. DOI: 10.1080/08995601003638967
- Haley RW. Point: bias from the “healthy-warrior effect” and unequal follow-up in three government studies of health effects of the Gulf War. *American Journal of Epidemiology*. 1998; 148:315–323. [PubMed: 9717872]

- Heavey SC, Homish DL, Goodell EA, Homish GG. U.S reserve soldiers' combat exposure and intimate partner violence: Not more common but it is more violent. *Stress and Health*. 2017; :1–7. [Online ahead of print]. DOI: 10.1002/smi.2748
- Homish GG, Leonard KE. Spousal influence on smoking behaviors in a US community sample of newly married couples. *Social Science & Medicine*. 2005; 61:2557–2567. DOI: 10.1016/j.socscimed.2005.05.005 [PubMed: 15978712]
- Homish GG, Leonard KE. The drinking partnership and marital satisfaction: The longitudinal influence of discrepant drinking. *Journal of Consulting & Clinical Psychology*. 2007; 75:43–51. DOI: 10.1037/0022-006X.75.1.43 [PubMed: 17295562]
- Homish GG, Leonard KE. Spousal influence on general health behaviors in a community sample. *American Journal of Health Behavior*. 2008; 32:754–763. [PubMed: 18442354]
- Homish GG, Leonard KE, Cornelius JR. Individual, partner, and relationship factors associated with the nonmedical use of prescription drugs. *Addiction*. 2010; 105:1457–1465. [PubMed: 20528812]
- Homish GG, Leonard KE, Kearns-Bodkin JN. Alcohol use, alcohol problems, and depressive symptomatology among newly married couples. *Drug and Alcohol Dependence*. 2006; 83:185–192. [PubMed: 16337752]
- Jacobson IG, Ryan MA, Hooper TI, Smith TC, Amoroso PJ, Boyko EJ, Bell NS, et al. Alcohol use and alcohol-related problems before and after military combat deployment. *JAMA: Journal of the American Medical Association*. 2008; 300:663–675. DOI: 10.1001/jama.300.6.663 [PubMed: 18698065]
- 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. *Addictive Behaviors*. 2010; 35:840–843. DOI: 10.1016/j.addbeh.2010.03.023 [PubMed: 20471180]
- James LM, Van Kampen E, Miller RD, Engdahl BE. Risk and protective factors associated with symptoms of post-traumatic stress, depression, and alcohol misuse in OEF/OIF veterans. *Military Medicine*. 2013; 178:159–165. [PubMed: 23495461]
- Kehle SM, Ferrier-Auerbach AG, Meis LA, Arbisi PA, Erbes CR, Polusny MA. Predictors of postdeployment alcohol use disorders in National Guard soldiers deployed to Operation Iraqi Freedom. *Psychology of Addictive Behaviors*. 2012; 26:42–50. DOI: 10.1037/a0024663 [PubMed: 21823766]
- Kline A, Weiner MD, Ciccone DS, Interian A, St Hill L, Losonczy M. Increased risk of alcohol dependency in a cohort of National Guard troops with PTSD: a longitudinal study. *Journal of Psychiatric Research*. 2014; 50:18–25. DOI: 10.1016/j.jpsychires.2013.11.007 [PubMed: 24332924]
- Larson GE, Highfill-McRoy RM, Booth-Kewley S. Psychiatric diagnoses in historic and contemporary military cohorts: combat deployment and the healthy warrior effect. *American Journal of Epidemiology*. 2008; 167:1269–1276. DOI: 10.1093/aje/kwn084 [PubMed: 18436536]
- Leonard KE, Homish GG. Predictors of heavy drinking and drinking problems over the first 4 years of marriage. *Psychology of Addictive Behaviors*. 2008; 22:25–35. DOI: 10.1037/0893-164X.22.1.25 [PubMed: 18298228]
- Lipari, RN., Forsyth, B., Bose, J., Kroutil, LA., Lane, ME. Spouses and children of U S military personnel: Substance use and mental health profile from the 2015 National Survey on Drug Use and Health. Substance Abuse and Mental Health Administration; 2016. Retrieved from <https://www.samhsa.gov/data/sites/default/files/NSDUH-MilitaryFamily-2015/NSDUH-MilitaryFamily-2015.htm> [June 26, 2017]
- Maguen S, Lucenko BA, Reger MA, Gahm GA, Litz BT, Seal KH, Marmar CR, et al. The Impact of reported direct and indirect killing on mental health symptoms in Iraq War veterans. *Journal of Traumatic Stress*. 2010; 23:86–90. DOI: 10.1002/jts.20434 [PubMed: 20104592]
- Maguen S, Vogt DS, King LA, King DW, Litz BT, Knight SJ, Marmar CR. The impact of killing on mental health symptoms in Gulf War veterans. *Psychological Trauma-Theory Research Practice and Policy*. 2011; 3:21–26. DOI: 10.1037/a0019897

- Manchon Walsh P, Carrillo P, Flores G, Masuet C, Morchon S, Ramon JM. Effects of partner smoking status and gender on long term abstinence rates of patients receiving smoking cessation treatment. *Addictive Behaviors*. 2007; 32:128–136. [PubMed: 16650624]
- Milliken CS, Auchterlonie JL, Hoge CW. Longitudinal assessment of mental health problems among active and reserve component soldiers returning from the Iraq war. *JAMA: Journal of the American Medical Association*. 2007; 298:2141–2148. DOI: 10.1001/jama.298.18.2141 [PubMed: 18000197]
- Schumm JA, Chard KM. Alcohol and stress in the military. *Alcohol Research: Current Reviews*. 2012; 34:401–407. [PubMed: 23584106]
- Seal KH, Cohen G, Waldrop A, Cohen BE, Maguen S, Ren L. Substance use disorders in Iraq and Afghanistan veterans in VA healthcare, 2001-2010: Implications for screening, diagnosis and treatment. *Drug & Alcohol Dependence*. 2011; 116:93–101. [PubMed: 21277712]
- Spera C, Thomas R, Barlas F, Szoc R, Cambridge M. Relationship of military deployment recency, frequency, duration, and combat exposure to alcohol use in the Air Force. *Journal of Studies on Alcohol and Drugs*. 2011; 72:10.
- Sundin J, Herrell RK, Hoge CW, Fear NT, Adler AB, Greenberg N, Bliese PD, et al. Mental health outcomes in US and UK military personnel returning from Iraq. *British Journal of Psychiatry*. 2014; 204:200–207. DOI: 10.1192/bjp.bp.113.129569 [PubMed: 24434071]
- Vest BM, Heavey SC, Homish DL, Homish GG. Marital Satisfaction, Family Support, and Pre-Deployment Resiliency Factors Related to Mental Health Outcomes for Reserve and National Guard Soldiers. *Military Behavioral Health*. 2017; :00–00. [Online ahead of print]. DOI: 10.1080/21635781.2017.1343694
- Vogt, D., Smith, BN., King, DW., King, LA. *Manual for the Deployment Risk and Resilience Inventory-2 (DRRI-2): A collection of measures for studying deployment-related experiences of military veterans*. Boston, MA: National Center for PTSD; 2012.

Table 1

Demographic Characteristics

Characteristic	Male Soldiers (N=248)		Female Partners (N=248)	
	Mean or %	SD or N	Mean or %	SD or N
Age	33.4	6.2	32.0	6.5
Race/Ethnicity				
Non-Hispanic White	81.1%	201	88.7%	220
Non-Hispanic Black	4.4%	11	1.2%	3
Hispanic	9.7%	24	5.2%	13
Other	3.2%	8	3.6%	9
Education				
<HS – HS Grad	14.1%	35	9.3%	23
Some College	60.1%	149	42.3%	105
College +	25.8%	64	48.4%	120
Married	75.4%	187	75.4%	187
Cohabiting	24.6%	61	24.6%	61
Family Income (Median)	\$60,000 to \$79,000			

Unadjusted Results for Within and Cross Spouse Effects of Male Soldier's Experiences on Alcohol Problems and Frequent Heavy Drinking (N=248)

Table 2

Male Soldier's Experiences	Alcohol Problems				Heavy Drinking			
	Soldier		Spouse		Soldier		Spouse	
	RR	[95% CI]	RR	[95% CI]	RR	[95% CI]	RR	[95% CI]
1 vs 2+ Deployments	1.01	[0.83, 1.23]	1.07	[0.84, 1.36]	1.07	[0.93, 1.23]	1.11	[0.96, 1.28]
Combat Exposure	1.01 *	[1.01, 1.01]	1.01	[1.00, 1.02]	1.01 *	[1.01, 1.01]	1.01 **	[1.01, 1.01]

* p < 0.05;

**

p < 0.01;

p < 0.001

Adjusted Results for Within and Cross Spouse Effects of Male Soldier's Experiences on Alcohol Problems and Frequent Heavy Drinking (N=248)

Table 3

Male Soldier's Experiences	Alcohol Problems				Heavy Drinking			
	Soldier		Spouse		Soldier		Spouse	
	RR	[95% CI]	RR	[95% CI]	RR	[95% CI]	RR	[95% CI]
1 vs 2+ Deployments	1.10	[0.90, 1.35]	1.11	[0.87, 1.41]	1.14	[0.99, 1.32]	1.09	[0.94, 1.26]
Combat Exposure	1.00	[1.00, 1.01]	1.00	[1.00, 1.01]	1.01*	[1.01, 1.01]	1.01*	[1.01, 1.01]
Age	.99	[0.97, 1.00]	.99	[0.97, 1.01]	.98*	[0.97, 0.99]	.99	[0.98, 1.01]
PTSD	1.01**	[1.01, 1.02]	.99	[0.99, 1.00]	1.00	[1.00, 1.01]	1.00	[0.99, 1.00]
Alcohol Problems	---	---	1.06***	[1.03, 1.09]	---	---	---	---
Frequent Heavy Drinking	---	---	---	---	---	---	1.09***	[1.04, 1.14]

* p < 0.05;

** p < 0.01;

*** p < 0.001

--- = Not applicable, covariate not included in that model