Title

Trauma Exposure Predicts Alcohol, Nicotine, and Drug Problems Beyond the Contribution of PTSD and Depression in Patients with Cardiovascular Disease: Data from the Heart and Soul Study

Journal

American Journal on Addictions, 23(1)

ISSN

1055-0496

Authors

Waldrop, Angela E
Cohen, Beth E

Publication Date

2014

DOI

10.1111/j.1521-0391.2013.12053.x

Peer reviewed

Published in final edited form as:
Am J Addict. 2014 January ; 23(1): . doi:10.1111/j.1521-0391.2013.12053.x.

Trauma exposure predicts alcohol, nicotine, and drug problems beyond the contribution of PTSD and depression in patients with cardiovascular disease: Data from the Heart and Soul Study

Angela E. Waldrop, Ph.D[1,2] and **Beth E. Cohen, M.D., M.A.S.**[1,2]

[1]San Francisco VA Medical Center, 4150 Clement Street, 116P, San Francisco, CA, USA 94121

[2]University of California, San Francisco, 401 Parnassus Avenue, San Francisco, CA, USA 94143

Abstract

Background and Objectives—This study examined the role of lifetime trauma exposure in a longitudinal study of adults with cardiovascular disease to determine the unique contribution of trauma exposure to risk for drug and alcohol problems and smoking.

Methods—Data were drawn from the Heart and Soul Study, a prospective cohort study designed to determine the mechanisms of associations between psychological factors and increased risk of cardiovascular events in high-risk patients (n = 1,022).

Results—Lifetime exposure to a higher number of trauma types predicted substance use outcomes beyond risk explained by PTSD and depression. In addition, across trauma types, interpersonal traumas were most strongly associated with substance use problems.

Conclusions—Our results suggest that, though PTSD and depression play a role in the association between trauma exposure and substance use, many other factors also contribute; therefore focusing on these psychological comorbidities alone is not sufficient.

Scientific Significance—The integration of mental health care and/or case management support with primary and specialty medical care may improve detection and treatment for patients with substance use and comorbid mental and physical health problems. Screening for trauma exposure is an important part of good clinical care.

1. Introduction

The high co-occurrence of posttraumatic stress disorder (PTSD) and substance use disorders (SUD) continues to be documented across civilian and veteran populations.[1, 2] Three primary hypotheses exist to explain the high co-occurrence of trauma exposure and substance use disorders.[3]. The most widely supported hypothesis is that self-medication of distress after trauma drives comorbidity with SUD.[4-7] Another frequently cited explanation is that substance misuse places individuals at increased risk for trauma exposure,[8] perhaps through lifestyle factors such as association with violent peers and engagement in illegal activities. A third explanation attributes the association of substance misuse with trauma

Corresponding author: Angela E. Waldrop, Ph.D., 4150 Clement Street, 116P, San Francisco, CA, USA 94121, Phone: (415) 221-4810 ext. 6308, Fax: (415) 750-6921, angela.waldrop@ucsf.edu.

Contributors: Drs. Waldrop and Cohen designed the study and wrote the manuscript. Dr. Waldrop conducted the statistical analyses with assistance from Bee Ya Na, research assistant. Both authors contributed to and have approved the final manuscript.

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

exposure to one or more additional factors that confer risk for both problems, for example, genetic and environmental factors.[9]

In many studies of co-occurring PTSD and substance use disorders, people who have been exposed to traumatic events are included in the non-PTSD "control" groups. Epidemiological research shows that a significant percentage of the population is exposed to potentially traumatic events even though most people do not go on to develop PTSD or other diagnosable psychopathology.[10, 11] More recently, investigators have begun to examine negative outcomes related to trauma exposure beyond what can be explained by the PTSD diagnosis. Existing studies suggest that exposure to potentially traumatic events (e.g., interpersonal violence, natural disasters, combat) may increase the risk for alcohol and drug abuse in individuals who never develop PTSD, in whom PTSD has resolved, or beyond the risk conferred by PTSD itself.[12, 13] There is strong evidence of the negative cumulative effects of trauma exposure, including a dose-response effect of trauma exposure and risk for substance use problems.[14] Some studies have found, however, that exposure to trauma (including combat) without PTSD was not sufficient to account for risk of alcohol and other drug use disorders.[3, 15-17] The cross-sectional nature of most prior studies has not permitted the examination of these relationships over time.

We examined the role of lifetime trauma exposure in a longitudinal study of adults to determine the unique contribution of trauma exposure to risk for drug and alcohol problems and smoking. We controlled for PTSD and depression at the time of the substance use assessments to determine what predictive role exposure to stressful experiences might play in the development of substance addiction. In addition to trauma exposure, we examined the risk associated with specific *types* of trauma exposure, including physical assault, sexual assault, natural disasters, serious accidents, and combat. Because the study was longitudinal, we were able to examine risk models for substance use outcomes at baseline and at a 5-year follow-up. We hypothesized that lifetime exposure to more types of trauma would confer greater risk for drug, alcohol, and nicotine addiction. We also predicted that exposure to interpersonal traumatic events and combat would increase risk for later substance use problems.

2. Methods

2.1 Participants

The Heart and Soul Study is a prospective cohort study designed to determine the mechanisms of associations between psychological factors and increased risk of cardiovascular events in patients with cardiovascular disease (CVD). Methods have been described previously.[18] Administrative data were used to identify outpatients with documented coronary artery disease at two Department of Veterans Affairs Medical Centers (San Francisco VA Medical Center and the VA Palo Alto Health Care System, California), one university medical center (University of California, San Francisco), and nine public health clinics in the Community Health Network of San Francisco. Patients were eligible to participate if they had known CVD documented by at least one of the following: a history of myocardial infarction, angiographic evidence of ≥50% stenosis in one of more coronary vessels, prior evidence of inducible ischemia by treadmill or nuclear testing, or a history of coronary revascularization. Between September 11, 2000 and December 20, 2002, a total of 1,024 participants were enrolled. Two participants were excluded from the final analysis because they did not complete the Diagnostic Interview Schedule for PTSD, leaving 1,022 participants for baseline analyses. Between September 2005 and December 2007, 667 participants (80% of the 829 survivors) completed a 5-year follow-up examination (Y5).

2.2.1 Trauma Exposure Variables—A lifetime history of 17 traumatic events was assessed at baseline using the Computerized Diagnostic Interview Schedule for DSM-IV (CDIS), a validated computer-based interview administered by trained research personnel.[19, 20] This standardized tool includes questions about traumatic events, such as being shot or stabbed, being sexually assaulted, or seeing someone seriously injured or killed. Individuals who had been in military combat were also asked if they had been held captive or tortured, been wounded, seen someone seriously injured or killed, or unexpectedly discovered a dead body during their military service. All responses were coded yes/no, and a trauma exposure score was calculated (range 0 to 17, including the 4 combat-related items). The number of types of lifetime traumatic events followed a normal distribution.

2.2.2 Drug and Alcohol Use Variables—Drug and alcohol use were assessed using questions created for this study. The same questions were used at the baseline and Y5 follow-up visits. To evaluate history of drug addiction, participants were asked, “Has a doctor or nurse ever told you that you have drug addiction/abuse?” To evaluate history of alcoholism, participants were asked “Has a doctor or nurse ever told you that you have alcoholism or problem drinking?” Smoking status was assessed with the question, “Do you currently smoke cigarettes?”

2.2.3 Covariates—PTSD was evaluated with the Computerized Diagnostic Interview Schedule for DSM-IV (CDIS), a validated, computer-based interview administered by trained research personnel,[19] which assesses PTSD based on criteria outlined in the Diagnostic and Statistical Manual IV American Psychiatric Association.[20] The CDIS has a sensitivity of 88% and specificity of 73% compared to gold standard clinical interviews for PTSD and it has shown good test re-test reliability.[21] Depression was assessed with the validated 9-item Patient Health Questionnaire (PHQ).[22] A score of 10 or higher has a sensitivity of 88% and a specificity of 88% for major depressive disorder.[23] Participants also completed a demographic questionnaire. Demographic covariates were selected based on their statistically significant relationships to the number of trauma types: gender, age, and race (White versus non-White).

2.3 Statistical analysis

Descriptive statistics were computed for baseline and Y5 for the following variables: demographics, history of substance use problems, and depression and PTSD. A series of ANCOVAs were conducted with a separate analysis for each substance use history measure (i.e., history of alcoholism or drug abuse or current smoking at baseline and at Y5). For each ANCOVA, the dependent variable was the number of trauma exposure types and the independent variable was one of the substance use history variables. The covariates in each model were demographics (age, gender, and White versus non-White race), PTSD, and depression. In the ANCOVA analyses of Y5 data, baseline measures of substance use history were also included as covariates.

Logistic regression analyses were conducted to examine the relationships between each substance use outcome variable and PTSD and depression at BL and Y5, using data from participants who completed assessments at both time points. These analyses were stratified by gender and included age and race (White versus non-White) as covariates. To test the relative associations of different trauma types to substance use histories, we used logistic regression. We examined five specific types of trauma exposure as predictors: physical assault, sexual assault, disasters (e.g., fire, flood, and earthquake), serious accidents, and combat. Each substance use history variable was analyzed as the dependent variable in its own logistic regression model. We tested each regression model in two stages, starting with

trauma exposure variables and demographic covariates entered first, and then adding PTSD and depression as covariates. IBM SPSS Statistics Version 20 was used to conduct all statistical analyses.[24]

3. Results

Descriptive statistics for baseline and Y5 are presented in Table 1a and 1b, including demographics, history of substance use problems, current depression, history of PTSD, coronary heart disease indicators (Table 1a), and exposure to different trauma types (Table 1b). Analyses were conducted with the full available data at BL and Y5, then again with only the data from the subset of participants who completed both BL and Y5 assessments. The pattern of results was the same in both sets of analyses, although the lower statistical power in the subsample analyses made the tests for some associations statistically nonsignificant.

3.1 PTSD and depression as predictors of a history of alcohol and drug addiction/abuse and smoking

As noted above, these analyses included age and race (White versus non-White) as covariates and they were conducted on data from the subsample of participants who completed both time points. At BL, a history of alcoholism was not associated with PTSD or depression for men (p = .08 and .89, respectively) or women (p = .28 and .74, respectively). At Y5, a history of alcoholism was associated with depression among men (OR = 2.22, 95% CI 1.21 – 4.08), but not women (p = .84). PTSD was not significant in either Y5 equation for history of alcoholism (men: p = .90 and women: p = 1.00). For history of drug problems at BL, neither PTSD nor depression was statistically significant in models for male (p = .87 and .16, respectively) or female participants (p = .22 and .48, respectively). At Y5, however, depression was associated with a greater likelihood of a drug problem history for men (OR = 5.28, 95% CI 2.36 – 11.82), but not for women (p = .53). PTSD was not significant in the equation for either gender for history of drug problems reported at Y5 (men: p = .93 and women: p = .39). Smoking at BL was not associated with PTSD or depression for men (p = . 19 and .19, respectively) or women (p = .10 and .78, respectively). At Y5, depression was a significant predictor in the male sample (OR = 2.50, 95% CI 1.36 – 4.59), but not for women (p = .16). PTSD was not significant for either gender to predict smoking status at Y5 (men: p = .42 and women: p = 1.0).

3.2 Number of types of trauma exposure as a predictor of a history of alcohol and drug addiction/abuse and smoking

An ANCOVA was conducted to compare number of types of trauma exposure for participants with and without a history of alcoholism. The mean (adjusted mean ± SE) number of trauma types was higher in the group with a history of alcoholism (See Table 2). An ANCOVA was conducted to compare groups who did and did not report a history of alcoholism at Y5 on their reports of trauma exposure at baseline. The mean number of trauma types was higher in the group with a history of alcoholism at Y5 (See Table 2).

When a similar set of analyses was conducted to compare groups with and without a history of drug addiction or abuse, the same pattern of results emerged. In the ANCOVA, the group who reported a history of drug problems had a higher number of trauma types at baseline (See Table 2). At Y5, the group who reported a history of drug problems also had a higher number of trauma types at baseline (See Table 2).

Current smoking status was the final substance use outcome variable examined. At baseline, current smokers reported higher numbers of trauma types, even with PTSD and depression

in the model as covariates (See Table 2). These group differences by smoking status did not hold at Y5.

3.3 Trauma types as predictors for alcohol problems, drug problems, and smoking

Alcohol Problems—As anticipated, the associations between trauma and substance use differed across types of traumatic events at baseline (see Table 3a) and Y5 (see Table 3b). For history of alcohol problems at baseline, physical assault and sexual assault were the only significant trauma variables in the model adjusted for demographics. In the final model, adjusted for demographics, PTSD, and depression, physical assault was again the only specific trauma exposure that predicted a history of alcohol problems, with additional variance accounted for by age (OR = .96, 95% CI .95 - .98) and gender (OR = .26, 95% CI . 13 - .55; males at greater risk). In gender-stratified baseline analyses, physical assault predicted alcohol problems for men and sexual assault predicted alcohol problems for women (Table 3a).

At Y5, sexual assault was marginally significant (p = .06) in the model adjusted for demographics. In the final model adjusted for PTSD and depression, the baseline presence or absence of a history of alcohol problems largely accounted for reporting a history of alcohol problems at the Y5 follow-up (Table 3b; OR = 77.59, 95% CI 35.71 – 168.56). In gender-stratified Y5 analyses, none of the trauma types significantly predicted a history of alcohol problems in men and the model would not converge in our small sample of women (Table 3b).

Drug Problems—In the initial demographics-adjusted model with trauma types predicting baseline history of drug problems, physical and sexual assault were significant predictors (Table 3a). Both physical and sexual assault remained significant in the model adjusted for PTSD and depression, with additional variance accounted for by age, education, gender (OR = .30, 95% CI .13 - .73; males more at risk), and depression (OR = 2.83, 95% CI 1.60 – 5.03). The gender-stratified baseline analyses showed that the results for men was consistent with the findings in the full sample, with physical and sexual assault appearing as significant predictors for a history of alcohol problems. None of the trauma types was a significant predictor of a history of alcohol problems reported for women at baseline.

At Y5, none of the trauma types predicted drug problems in either adjusted model. In final model, adjusted for PTSD and depression, baseline report of a history of drug problems was the strongest predictor (Table 3b; OR = 59.51, 95% CI 18.65 – 189.88). Depression (OR = 5.41, 95% CI 1.90 – 15.45) was also a significant predictor variable. None of the trauma types was a significant predictor among the male sample, although depression was significant (OR = 5.24, 95% CI 1.81 – 15.12). The models would not converge in the female sample.

Smoking—In the prediction of smoking status at baseline in the full sample, physical assault was significant in the demographics-adjusted model. In the final model adjusted for PTSD and depression, physical assault remained the only significant trauma variable, and additional variance was accounted for by age, race (OR = .70, 95% CI .50 – .99; Whites at lower risk), and depression (OR = 1.74, 95% CI 1.17 – 2.58). Among men, physical assault was a significant predictor in the first model, but became marginally significant when PTSD and depression were added to the equation. Interestingly, among women, exposure to a disaster predicted a *lower* likelihood of being a smoker in models adjusted for demographics and for both demographics and PTSD and depression.

At Y5, none of the trauma types predicted smoking status in adjusted models. The only significant predictor in the Y5 final adjusted model were age (OR = .94, 95% CI .90 - .97)

and baseline smoking status (OR = 130.70, 95% CI 57.10 – 299.14). None of the trauma types was a significant predictor among the male sample and the models would not converge in the female sample.

4. Discussion

In this cohort of community-dwelling adults with coronary heart disease, exposure to a larger number of trauma types was associated with increased report of tobacco use and drug and alcohol problems at baseline, including models adjusted for PTSD and depression (see Table 3a). Specific types of trauma, such as physical and sexual assault and serious accidents, were also independently associated with self-reported drug and alcohol problems and/or smoking. Reports of trauma exposure at baseline did not predict tobacco use and drug and alcohol problems 5 years later, at least not beyond the predictive power of covariates (demographics, PTSD, and depression). The most consistent predictors of Y5 reported history of substance use problems were baseline reports of those problems, although there was also a relationship between depression and Y5 reports of having a drug abuse history.

A large number of studies have documented the association of mental health disorders and increased rates of substance use, abuse, and dependence. The National Comorbidity Survey 10-year follow-up study found that baseline mood and anxiety disorders were predictive of at least one form of substance dependence.[25] This represents one of the largest prospective studies of mental health disorders and substance use. However, relatively few studies have evaluated the role of trauma in substance use independent of mental health disorders, especially PTSD. In those that have, the evidence has been mixed regarding the unique contribution of trauma exposure to risk for substance use disorders.[16, 17] Gender differences seem to account in part for the mixed findings.[3] Our gender-stratified analyses of PTSD and depression as predictors for substance use outcomes found, interestingly, that PTSD was not a significant predictor in any of the equations at baseline or the five year follow-up. The only significant findings in these analyses emerged in the associations between depression and all three substance use outcomes for men only at Y5. The results of our primary analyses of interest, examining the role of trauma exposure, were consistent with findings from a prior study that used data from the subset of trauma-exposed participants from a larger epidemiological study. They found that the number of types of traumatic events experienced predicted the likelihood of substance abuse, including nicotine, beyond the risk associated with a PTSD diagnosis.[26]

Although PTSD is often the primary focus of traumatic stress research, increased risk for other forms of psychopathology is also associated with trauma exposure.[27] Several studies in veterans and civilians have supported the hypothesis that self-medication of PTSD drives comorbidity with SUD.[3-6] It is possible that the association of trauma exposure and SUD is also driven by self-medication of distress other than or in addition to PTSD. A growing body of literature suggests that temperament may help determine whether individuals will respond to traumatic experiences with “externalizing” (e.g., drug and alcohol abuse) versus “internalizing” (e.g., depression) symptoms.[28-31] In our results, depression was associated with increased risk for a history of alcohol and drug problems and smoking, at least among men at the five-year follow-up assessment.

Our results also extend the existing research which suggests that different types of trauma carry different degrees of risk for substance use disorders.[3, 5] In our sample, interpersonal traumas (i.e., sexual assault and physical assault) and serious accidents were more consistently related to drug and alcohol outcomes than were other types of trauma (i.e., disasters). Some authors have hypothesized that the intentional nature of some traumatic events and the degree to which they result in a sense of personal violation or injury may

contribute to the likelihood of negative outcomes.[32] Interpersonal traumas may also be more likely to occur in the absence of protective factors sometimes associated with more collective traumatic experiences (e.g., shared experiences and community support during disasters, military training for combat). These findings warrant further research.

4.1 Limitations

The results of this study should be interpreted in light of several limitations. The Heart and Soul Study sample is majority male and all patients had existing heart disease, which may limit generalizability. Because participants in the Heart and Soul Study were asked to complete a very large number of assessments across health domains, many of the assessments for mental health and substance use were limited to brief screening questions (versus clinical diagnostic assessments). For example, the questions on history of substance use do not include data on type of substances, frequency of use, or total length of time used. History of PTSD and depression were also assessed with brief screening questions.; In-depth diagnostic assessments for these conditions could yield somewhat different results, although it is difficult to say in what direction the results might change. Typically, diagnostic assessments yield lower prevalence rates than do screening tools. In the case of this study, however, we asked participants about whether they had been told by a doctor or nurse that they had drug or alcohol problems; our intent was to capture substance use that reached diagnosable levels of misuse. This way of assessing for a history of substance use problems could be considered more conservative than a screener that asks only for the respondents' own knowledge of his or her use without being explicitly labeled as problematic by a healthcare provider. Similarly, though we used a validated trauma questionnaire to assess whether respondents were ever exposed to a range of categories of traumatic events, we do not have information about the frequency of different types of events, specific ages of occurrence, and patients' perceptions of the severity of each event. In addition, some of our analyses were limited in statistical power. The low prevalence of PTSD in our sample at the 5-year follow-up limited the power to detect a possible relationship between PTSD and substance use, so the results of those analyses should be viewed with caution. Finally, though the cohort was followed prospectively and the majority of the surviving participants completed Y5 follow-up, many participants were deceased at the follow-up time point and this may have reduced statistical power for prospective analyses.

4.2 Implications

This study suggests that evaluating patients' trauma history may provide valuable information on their risk for adverse health behaviors, such as tobacco, alcohol, and illicit substance use. In care settings where highly-traumatized populations are seen, it may be useful to institute standardized screening for substance use. This has been done throughout the Department of Veterans Affairs medical system, which requires regular screening for alcohol use problems and tobacco use. Beyond screening, it is important to consider how the overlap of psychological trauma and substance use disorders affects patient care. Our results suggest that though PTSD and depression play a role in this association, many other factors contribute, and therefore focusing on these psychological comorbidities alone may not be sufficient. Several integrated care models have been developed to simultaneously treat posttraumatic stress and substance abuse, and studies have demonstrated that such models improve retention rates and reduce substance abuse relapse rates.[33] In the absence of specific programs, integration of primary medical care with mental health care and/or case management support may also improve treatment for patients with substance use and comorbid mental and physical health problems. Examining such models is important if we wish to reduce SUD and improve the health and longevity of the large number of patients exposed to psychological trauma.

Acknowledgments

We would like to thank Bee Ya Na for her assistance with data analyses. We would also like to thank Mary Whooley, M.D., Principal Investigator for the Heart and Soul Study, for allowing us access to the data.

Role of Funding Sources: Dr. Waldrop was supported by NIH/NIDA grant number 5K23DA018718-05. Dr. Cohen was supported by NIH/NHLBI grant number K23 HL 094765-01, Department of Defense/NCIRE grant DAMD17-03-1-0532, W81XWH-05-2-0094, and a grant from the Irene Perstein Foundation. The Heart and Soul Study was funded by the Department of Veterans Affairs, Washington, DC, the National Heart Lung and Blood Institute (R01 HL079235), Bethesda, MD, the American Federation for Aging Research (Paul Beeson Scholars Program), New York, NY, the Robert Wood Johnson Foundation (Faculty Scholars Program), Princeton, NJ, the Ischemia Research and Education Foundation, South San Francisco, CA, and the Nancy Kirwan Heart Research Fund, San Francisco, CA. The funding organizations were not involved in the design and conduct of the study; collection, management, analysis, and interpretation of the data; or preparation, review, or approval of the manuscript. The contents of the manuscript are solely the responsibility of the authors and do not necessarily represent the official views of any of these funding agencies.

References

1. Kessler RC, et al. Posttraumatic stress disorder in the National Comorbidity Survey. Arch Gen Psychiatry. 1995; 52:1048–60. [PubMed: 7492257]
2. Seal KH, et al. 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; 167:476–82. [PubMed: 17353495]
3. Breslau N, Davis GC, Schultz LR. Posttraumatic stress disorder and the incidence of nicotine, alcohol, and other drug disorders in persons who have experienced trauma. Archives of General Psychiatry. 2003; 60:289–94. [PubMed: 12622662]
4. Jacobson IG, et al. Alcohol use and alcohol-related problems before and after military combat deployment. JAMA. 2008; 300:663–75. [PubMed: 18698065]
5. Danielson CK, et al. Trauma-related risk factors for substance abuse among male versus female young adults. Addict Behav. 2009; 34:395–9. [PubMed: 19110381]
6. Waldrop AE, et al. Triggers for cocaine and alcohol use in the presence and absence of posttraumatic stress disorder. Addictive Behaviors. 2007; 32:634–9. [PubMed: 16863682]
7. Harris KM, Edlund MJ. Self-medication of mental health problems: New evidence from a national survey. Health Services Research. 2005; 40:117–134. [PubMed: 15663705]
8. Stein MB, et al. Patterns of incidence and psychiatric risk factors for traumatic events. International Journal of Methods in Psychiatric Research. 2002; 11:143–53. [PubMed: 12459818]
9. Scherrer JF, et al. Posttraumatic stress disorder; combat exposure; and nicotine dependence, alcohol dependence, and major depression in male twins. Compr Psychiatry. 2008; 49:297–304. [PubMed: 18396190]
10. Resnick HS, et al. Prevalence of civilian trauma and posttraumatic stress disorder in a representative national sample of women. Journal of Consulting & Clinical Psychology. 1993; 61:984–991. [PubMed: 8113499]
11. Perkonigg A, et al. Traumatic events and post-traumatic stress disorder in the community: Prevalence, risk factors and comorbidity. Acta psychiatrica Scandinavica. 2000; 101:46–59. [PubMed: 10674950]
12. Stewart SH. Alcohol abuse in individuals exposed to trauma: A critical review. Psychological Bulletin. 1996; 120:83–112. [PubMed: 8711018]
13. Boscarino JA, Adams RE, Galea S. Alcohol use in New York after the terrorist attacks: A study of the effects of psychological trauma on drinking behavior. Addict Behav. 2006; 31:606–21. [PubMed: 15982827]
14. Dube SR, et al. Adverse childhood experiences and personal alcohol abuse as an adult. Addict Behav. 2002; 27:713–25. [PubMed: 12201379]
15. McFall ME, Mackay PW, Donovan DM. Combat-related posttraumatic stress disorder and severity of substance abuse in Vietnam veterans. J Stud Alcohol. 1992; 53:357–63. [PubMed: 1619930]

16. Driessen M, et al. Trauma and PTSD in patients with alcohol, drug, or dual dependence: A multi-center study. Alcohol Clin Exp Res. 2008; 32:481–8. [PubMed: 18215214]

17. Johnson SD, Striley C, Cottler LB. The association of substance use disorders with trauma exposure and PTSD among African American drug users. Addictive Behaviors. 2006; 31:2063–73. [PubMed: 16580784]

18. Whooley MA, et al. Depressive symptoms, health behaviors, and risk of cardiovascular events in patients with coronary heart disease. JAMA. 2008; 300:2379–88. [PubMed: 19033588]

19. Robins LN, et al. National Institute of Mental Health Diagnostic Interview Schedule. Its history, characteristics, and validity. Archives of General Psychiatry. 1981; 38:381–9. [PubMed: 6260053]

20. American Psychiatric Association. , editor. Diagnostic and Statistical Manual of Mental Disorders. 4th. American Psychiatric Association; Washington, D.C.: 2000. text revision

21. Kulka, RA., et al. Contractual report of findings from the National Vietnam Veterans Readjustment Study Volume 1: Executive summary, description of findings, and technical appendices. Research Triangle Park, NC: Research Triangle Park Institute; 1988.

22. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. JAMA. 1999; 282:1737–44. [PubMed: 10568646]

23. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. J Gen Intern Med. 2001; 16:606–13. [PubMed: 11556941]

24. IBM. SPSS Statistics. 2011

25. Grant BF, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. Archives of General Psychiatry. 2004; 61:807–16. [PubMed: 15289279]

26. Del Gaizo AL, Elhai JD, Weaver TL. Posttraumatic stress disorder, poor physical health and substance use behaviors in a national trauma-exposed sample. Psychiatry Res. 2011; 188:390–395. [PubMed: 21481478]

27. Turner RJ, Lloyd DA. Stress burden and the lifetime incidence of psychiatric disorder in young adults: Racial and ethnic contrasts. Archives of General Psychiatry. 2004; 61:481–8. [PubMed: 15123493]

28. Evren C, et al. Relationship of alexithymia and temperament and character dimensions with lifetime post-traumatic stress disorder in male alcohol-dependent inpatients. Psychiatry and Clinical Neurosciences. 2010; 64:111–9. [PubMed: 20132531]

29. Miller MW, Resick PA. Internalizing and externalizing subtypes in female sexual assault survivors: Implications for the understanding of complex PTSD. Behavior therapy. 2007; 38:58–71. [PubMed: 17292695]

30. Miller MW, et al. The internalizing and externalizing structure of psychiatric comorbidity in combat veterans. J Trauma Stress. 2008; 21:58–65. [PubMed: 18302181]

31. Flood AM, et al. Prospective study of externalizing and internalizing subtypes of posttraumatic stress disorder and their relationship to mortality among Vietnam veterans. Compr Psychiatry. 2010; 51:236–42. [PubMed: 20399332]

32. Green BL. Defining trauma: Terminology and generic stressor dimensions. Journal of Applied Social Psychology. 1990; 20:1632–1642.

33. Dass-Brailsford P, Myrick AC. Psychological trauma and substance abuse: The need for an integrated approach. Trauma Violence Abuse. 2010; 11:202–13. [PubMed: 20823072]

Table 1a

Sample characteristics at baseline and Y5.

	Baseline n = 1,022	**Year 5 n = 667**
Demographics		
Age, years (*M* ± *SD*)	66.8 ± 10.9	70.9 ± 10.2
Male, n (%)	838 (82.0)	549 (82.3)
White, n (%)	615 (60.2)	398 (59.7)
Education (≥ high school, %)	890 (87.1)	584 (87.6)
Income (≥ $20,000, %)	519 (50.8)	370 (55.5)
Mental Health Diagnoses (self-report)		
PTSD		
Current	95 (9.3)	29 (4.3)
Prior	35 (3.4)	38 (5.7)
Never	892 (87.3)	596 (89.4)
Depression (current) (PHQ>=10)	198 (19.4)	117 (17.5)
History of Substance Use Problems		
History of alcoholism (%)	133 (13.0)	79 (11.8)
History of drug addiction/abuse (%)	71 (6.9)	35 (5.2)
Current smoker (%)	201 (19.7)	92 (13.8)
Medical History		
Hypertension	722 (70.8)	499 (75.6)
Myocardial Infarction	547 (53.8)	328 (49.9)
Stroke	147 (14.4)	108 (16.4)
Diabetes	265 (26.0)	192 (29.1)
Coronary Heart Disease Severity		
Exercise capacity, METs	7.3 ± 3.3	6.8 (3.0)
Left ventricular ejection fraction, %	0.6 ± 0.1	0.6 ± 0.1
Ischemia (wall motion score index)	1.2 ± 0.4	1.2 ± 0.3
Inducible ischemia (yes/no)	228 (24.3)	161 (29.3)
h/o revascularization (CABG or PTCA)	602 (59.0)	411 (62.3)
Health Related Quality of life	Excellent: 122 (11.9) Very Good: 312 (30.5) Good: 346 (33.9) Fair: 195 (19.1) Poor: 47 (4.6)	Excellent: 86 (13.0) Very Good: 224 (33.7) Good: 233 (35.1) Fair: 99 (14.9) Poor: 22 (3.3)

Table 1b

Sample characteristics at baseline and Y5: Restricted to participants with data at both time points.

	Baseline n = 667	**Year 5 n = 667**
Demographics		
Age, years (*M* ± *SD*)	66.1 ± 10.2	70.9 ± 10.2
Male, n (%)	549 (82.3)	549 (82.3)
White, n (%)	398 (59.7)	398 (59.7)
Education (≥ high school, %)	584 (87.6)	584 (87.6)
Income (≥ $20,000, %)	308 (46.4)	370 (55.5)
Mental Health Diagnoses (self-report)		
PTSD		
Current	61 (9.1)	29 (4.3)
Prior	25 (3.7)	38 (5.7)
Never	581 (87.17)	596 (89.4)
Depression (current) (PHQ>=10)	116 (17.4)	117 (17.5)
History of Substance Use Problems		
History of alcoholism (%)	77 (11.5)	79 (11.8)
History of drug addiction/abuse (%)	33 (4.9)	35 (5.2)
Current smoker (%)	111 (16.6)	92 (13.8)
Medical History		
Hypertension	459 (69.6)	499 (75.6)
Myocardial Infarction	341 (52.0)	327 (49.9)
Stroke	83 (12.6)	108 (16.4)
Diabetes	153 (23.2)	192 (29.1)
Coronary Heart Disease Severity		
Exercise capacity, METs	8.0 ± 3.2	6.8 ± 3.0
Left ventricular ejection fraction, %	0.62 ± 0.1	0.62 ± 0.1
Ischemia (wall motion score index)	1.1 ± 0.3	1.2 ± 0.3
Inducible ischemia (yes/no)	100 (18.8)	155 (29.2)
h/o revascularization (CABG or PTCA)	403 (60.5)	411 (62.3)
Health Related Quality of life	Excellent: 94 (14.2) Very Good: 312 (31.9) Good: 317 (32.7) Fair: 115 (17.3) Poor: 26 (3.9)	Excellent: 86 (13.0) Very Good: 224 (33.7) Good: 233 (35.1) Fair: 99 (14.9) Poor: 22 (3.3)

Table 2

Comparisons of groups with and without negative substance use conditions on number of traumatic event types experienced (adjusted means ± standard errors).[1]

	Baseline (full sample) n = 1,022	Baseline (Y5 completers) n = 667	Year 5 n = 667
History of alcoholism	n = 996	n = 650	n = 628
no	5.6 ± .09	5.4 ± .11	5.3 ± .12
yes	6.3 ± .23	6.1 ± .29	6.5 ± .41
p	.003	.03	.01
History of drug addiction/abuse	n = 1,008	n = 658	n = 645
no	5.6 ± .09	5.4 ± .10	5.4 ± .11
yes	7.1 ± .33	7.1 ± .45	6.8 ± .58
p	<.001	<.001	.02
Current smoker	n = 1,019	n = 666	n = 635
no	5.6 ±.10	5.4 ± .11	5.4 ± .12
yes	6.1 ±.20	6.0 ± .25	5.9 ± .41
p	.02	.04	.31

[1] ANCOVAs adjusted for age, race, gender, PTSD, and depression. In Year 5 analyses, the baseline indicator for the outcome variable was also included in the models.

Table 3a

Types of trauma exposure predicting history of alcoholism, history of drug addiction/abuse, and smoking status at baseline. (Note: Combat was excluded from analyses for the female subsample because only 2 women reported having had combat experiences.)

	Full Sample		Men		Women	
	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)
History of alcoholism	n = 996	n = 996	n = 816	n = 816	n = 180	n = 180
Physical assault	2.84 (1.78 – 4.52)	2.69 (1.69 – 4.30)	2.94 (1.80 – 4.81)	2.79 (1.70 – 4.57)	2.49 (.50 – 12.52)	2.84 (.54 – 15.03)
Sexual assault	1.84 (1.05 – 3.21)	1.63 (.91 – 2.90)	1.60 (.85 – 3.01)	1.38 (.72 – 2.66)	4.66 (1.11 – 19.47)	5.38 (1.22 – 23.71)
Disaster	.92 (.56 – 1.50)	.93 (.57 – 1.51)	.85 (.51 – 1.41)	.85 (.51 – 1.41)	2.24 (.25 – 19.68)	2.47 (.28 – 21.89)
Accident	1.12 (.76 – 1.66)	1.09 (.73 – 1.62)	1.06 (.70 – 1.60)	1.02 (.67 – 1.54)	2.02 (.53 – 7.79)	2.19 (.56 – 8.51)
Combat	1.00 (.63 – 1.59)	.93 (.58 – 1.49)	1.05 (.66 – 1.67)	.96 (.60 – 1.54)		
History of drug addiction/abuse	n = 1,008	n = 1,008	n = 828	n = 828	n = 180	n = 180
Physical assault	3.63 (1.72 – 7.68)	3.26 (1.53 – 6.97)	4.17 (1.80 – 9.65)	3.97 (1.70 – 9.29)	1.96 (.32 – 11.88)	1.01 (.13 – 7.89)
Sexual assault	2.66 (1.37 – 5.18)	2.15 (1.06 – 4.35)	2.91 (1.39 – 6.09)	2.48 (1.13 – 5.43)	2.61 (.56 – 12.21)	1.70 (.31 – 9.46)
Disaster	.75 (.39 – 1.45)	.78 (.40 – 1.52)	.74 (.36 – 1.50)	.75 (.37 – 1.55)	.84 (.14 – 4.91)	1.15 (.16 – 8.21)
Accident	1.38 (.81 – 2.35)	1.37 (.79 – 2.36)	1.35 (.76 – 2.42)	1.39 (.77 – 2.51)	1.29 (.30 – 5.58)	1.23 (.25 – 6.16)
Combat	.87 (.44 – 1.73)	.75 (.37 – 1.52)	.86 (.43 – 1.72)	.79 (.39 – 1.60)		
Current smoker	n = 1,019	n = 1,019	n = 835	n = 835	n = 184	n = 184
Physical assault	1.69 (1.17 – 2.45)	1.62 (1.11 – 2.35)	1.70 (1.12 – 2.57)	1.63 (1.07 – 2.48)	1.75 (.73 – 4.19)	1.69 (.69 – 4.18)
Sexual assault	1.12 (.68 – 1.84)	1.01 (.60 – 1.69)	1.02 (.54 – 1.93)	.92 (.48 – 1.78)	1.60 (.70 – 3.65)	1.51 (.63 – 3.63)
Disaster	.78 (.52 – 1.18)	.80 (.53 – 1.21)	1.04 (.65 – 1.69)	1.05 (.65 – 1.71)	.24 (.10 - .59)	.25 (.10 - .63)
Accident	1.40 (.99 – 1.97)	1.38 (.97 – 1.95)	1.41 (.96 – 2.07)	1.39 (.95 – 2.04)	1.20 (.52 – 2.74)	1.19 (.51 – 2.76)
Combat	1.18 (.77 – 1.80)	1.11 (.73 – 1.71)	1.19 (.78 – 1.83)	1.13 (.73 – 1.75)		

[1] Adjusted for age, race, and gender (in full sample analyses).

[2] Adjusted for age, race, gender (in full sample analyses), PTSD, and depression.

[3] Model would not converge.

Table 3b

Types of trauma exposure predicting history of alcoholism, history of drug addiction/abuse, and smoking status at Y5. (Note: Combat was excluded from analyses for the female subsample because only 2 women reported having had combat experiences.)

	Full Sample		Men		Women	
	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)	Adjusted for demographics OR[1] (95% CI)	Adjusted for demographics, PTSD, & Dep OR[2] (95% CI)
History of alcoholism	n = 628	n = 628	n = 514	n = 514	n = 113	n = 113
Physical assault	1.15 (.53 – 2.52)	1.26 (.57 – 2.75)	1.00 (.46 – 2.21)	1.10 (.50 – 2.45)	(-)[3]	(-)[3]
Sexual assault	2.53 (.96 – 6.68)	2.37 (.88 – 6.4)	1.89 (.64 – 5.61)	1.74 (.58 – 5.27)		
Disaster	1.31 (.52 – 3.35)	1.50 (.58 – 3.91)	1.28 (.50 – 3.28)	1.44 (.55 – 3.80)		
Accident	1.76 (.88 – 3.55)	1.82 (.90 – 3.68)	1.70 (.83 – 3.50)	1.75 (.85 – 3.61)		
Combat	1.50 (.65 – 3.45)	1.72 (.74 – 3.99)	1.49 (.65 – 3.39)	1.66 (.73 – 3.82)		
History of drug addiction/abuse	n = 645	n = 645	n = 532	n = 532	n = 113	n = 113
Physical assault	1.48 (.45 – 4.85)	1.58 (.44 – 5.64)	1.43 (.44 – 4.68)	1.50 (.42 – 5.33)	(-)[3]	(-)[3]
Sexual assault	2.35 (.69 – 8.03)	1.87 (.52 – 6.66)	1.99 (.53 – 7.57)	1.72 (.44 – 6.70)		
Disaster	1.38 (.36 – 5.35)	1.86 (.45 – 7.74)	1.26 (.33 – 4.75)	1.64 (.40 – 6.74)		
Accident	1.20 (.47 – 3.07)	1.18 (.44 – 3.14)	1.36 (.52 – 3.53)	1.35 (.50 – 3.65)		
Combat	2.24 (.71 – 7.00)	2.21 (.69 – 7.10)	2.07 (.68 – 6.32)	2.08 (.66 – 6.48)		
Current smoker	n = 635	n = 635	n = 520	n = 520	n = 115	n = 115
Physical assault	1.62 (.73 – 3.62)	1.61 (.72 – 3.58)	1.74 (.71 – 4.27)	1.77 (.72 – 4.36)	.82 (.10 – 6.64)	(-)[3]
Sexual assault	1.38 (.46 – 4.21)	1.39 (.45 – 4.30)	.73 (.17 – 3.09)	.71 (.16 – 3.17)	4.73 (.54 – 41.50)	
Disaster	1.15 (.45 – 2.91)	1.27 (.48 – 3.33)	.88 (.32 – 2.46)	.99 (.34 – 2.85)	4.25 (.31 – 57.84)	
Accident	.71 (.32 – 1.56)	.71 (.32 – 1.57)	.93 (.39 – 2.26)	.93 (.38 – 2.26)	.17 (.01 – 2.39)	
Combat	.46 (.17 – 1.25)	.49 (.18 – 1.38)	.47 (.17 – 1.27)	.49 (.17 – 1.37)	(-)	

[1] Adjusted for age, race, and gender (in full sample analyses). The baseline indicator for the outcome variable was also included in the model.

[2] Adjusted for age, race, gender (in full sample analyses), PTSD, and depression. The baseline indicator for the outcome variable was also included in the models.

[3] Model would not converge.