

**Mediating Behaviors on Alcohol and Substance Abuse Risk in US Veterans
A Study Using the Buffering Hypothesis**

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BLUF

The subject is alcohol and substance abuse risk in veterans. The question is, what factor contributes the most to the risk? Additionally, when factors are grouped as protective and risk factors, can the protective factors buffer the risk factors? Great questions. You may be surprised by the answer. It is daily stress. That's the bottom line upfront (BLUF). And more surprisingly, the protective factors did not buffer the risk factors. So, let's examine how we got there. This paper is a review of an exercise in quantitative methods.

METHODS

The study was a secondary data analysis of the open-source, non-restricted "*Military Health and Well-being Project 2020*" dataset obtained from the Inter-university Consortium for Political and Social Research. The project was a cross-sectional, online survey of 1495 post-Vietnam era veterans aged 18 years and older, conducted from May to June 2020. The comprehensive dataset included detailed information on service members' psychological, physical, and social well-being throughout and after their service. The secondary analysis aimed to evaluate the associations between the mediating factors and the risk of alcohol and substance abuse. The mediating factors were group as protective (calling and purpose, community engagement, help-seeking behaviors, military identity, quality of life, public service motivation, and overall wellness level) and risk factors (combat exposure, daily stress, loneliness, moral injury, self-stigma, suicidal ideation, and history of traumatic brain injury (TBI)).

Statistical Analysis

Data was presented with descriptive statistics and analyzed using selected bivariate analyses and stepwise linear regression modeling. Variable multicollinearity analysis was

conducted due to the large number of closely related variables. Effect sizes and variable inference patterns were also conducted to determine clinical relevance and causation.

The dataset variables used in this project were all composite and scalable variables derived from the summation of related metric questions, except for gender and race. Composite variables were treated as continuous variables because their scores represented a continuum from absent to present. Race was recoded from six levels to a binary variable, whites, including Hispanics, versus non-whites, owing to the low frequencies of many of the original levels. Known confounders of alcohol abuse were included in the models. These included age, gender, race, and socioeconomic status (SES). Income was used as a proxy for socioeconomic status (SES).

Several assumptions were made for the data analysis. According to the IQR rule, the income variable had 56 outliers. These were excluded from the analysis. There were 26 missing values for suicidal ideation, representing 1.7% of the total sample size. The mean for the variable (5.298) was imputed for missing values in the analysis. For this project, an R-value of ≥ 0.5 and ≤ -0.5 was considered statistically significant. Saturated and reduced models of protective and risk factors were independently performed to include and exclude confounding factors. The combined, saturated model of protective and risk factors, including confounders, was ultimately used for the final analysis, providing a robust and rigorous model.

RESULTS

Baseline characteristics

The mean age of the participants was 54 years. Of these, 80.3% were white, and 67.2% were males. The mean income was \$60,000 USD (Table 1). Additionally, 32.8% were Army or Army Reserve personnel, 59.6% were employed, 59.3% were married, and 33.9% resided in the

southeastern United States. The median length of service was 6 years, and the median number of years since discharge was 21 years.

Bivariate Analysis

Multicollinearity was assessed because of the large number of potentially correlated variables. The dendrogram analysis suggested that there may be collinearity between quality of life and overall wellness, as well as between military calling and public service motivation (Figure 1). However, among the risk factors, the dendrogram suggests that there may not be collinearity (Figure 2).

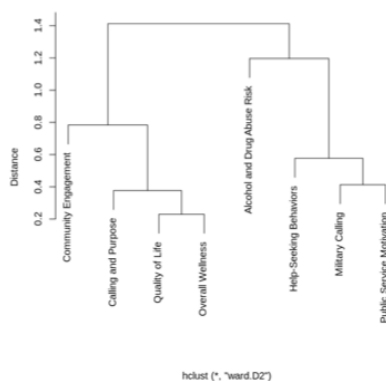


Figure 1: Dendrogram of Protective Factors

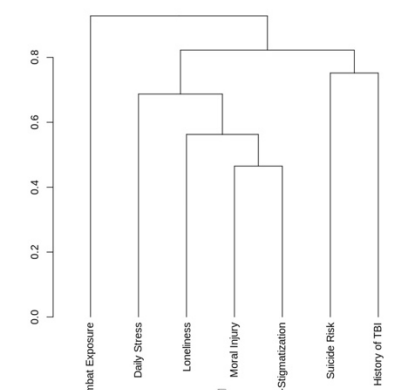


Figure 2: Dendrogram of Risk Factors

Variance inflation factors (VIFs) were calculated to quantify the dendrograms. All VIFs were < 5 , with overall wellness having the highest VIF of 3.385 (Table 2).

Table 3 presents Pearson’s correlations, and Figure 3 displays a heat map illustrating the correlations between protective, risk, and confounding factors and ASAR.

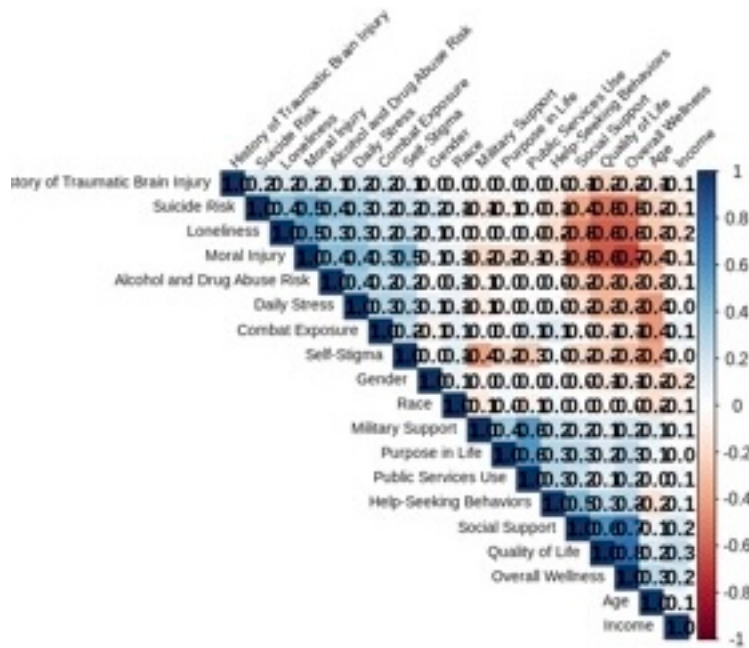


Figure 3: Heat Map of Protective, Risk, and Confounding Factors Correlated with Alcohol and Substance Abuse Risk Among Veterans

Several associations were identified. Community engagement was directly correlated with quality of life ($r = 0.61$) and overall wellness ($r = 0.71$). Public service motivation was directly correlated with calling and purpose ($r = 0.58$) and military identity ($r = 0.59$). Quality of life was directly correlated with overall wellness ($r = 0.78$) but indirectly correlated with loneliness ($r = -0.59$), moral injury ($r = -0.62$), and suicidal ideation ($r = -0.53$). Overall wellness was indirectly correlated with loneliness ($r = -0.58$), moral injury ($r = -0.70$), and suicidal ideation ($r = -0.53$). Finally, moral injury was indirectly correlated with social support ($r = -0.51$). ASAR was not correlated with any single variable.

Primary Outcome

Table 4 shows the stepwise regression analysis for all reduced and full models. Among the protective factors, calling and purpose contributed the most to the full protective factor model's (Table 4, Model 1a) ASAR (β coefficient = 0.019). However, the difference was not statistically significant. Both quality of life and overall wellness were statistically significant contributors; however, they had smaller β coefficients (-0.016, -0.010, respectively). Daily stress contributed the most to the full risk factor model ASAR (Table 4, Model 3a), (β coefficient of 0.129, and was statistically significant. Although ASAR was not correlated with any single factor, it was statistically significant in the overall model ($R = 0.518$, $p < 0.001$). The protective and risk factors explained 26.8% of the variance in the ASAR ($R^2 = 0.268$).

Secondary Outcomes

Across the models (Table 4, Models 1, 1a, 5, 5a, and 6), the β coefficients of the protective factors remained low and consistent, ranging from -0.020 to 0.021. Daily stress was the factor that contributed the most to the ASAR in all the combined protective and risk factor models (Table 4, Models 5, 5a, 6), with β coefficients ranging from 0.115 to 0.124.

Additional Analyses

An effect size calculation was conducted to assess clinical significance (Table 5). The overall effect size of the model was large (Cohen's $f^2 = 0.366$). Individual variable effect sizes were calculated using semi-partial correlation squared (sr^2). The effect sizes were negligible to small (<0.0243) except for moral injury ($sr^2 = 0.0773$, medium), daily stress ($sr^2 = 0.0.1541$, medium to large), and suicidal ideation ($sr^2 = 0.2313$, large). The confounding variable, gender, had a medium effect size ($sr^2 = 0.0785$).

Causal interference pattern analysis revealed a direct causal relationship between daily stress and ASAR (Figure 4). Both combat exposure and TBI were determined to be the most likely confounders.

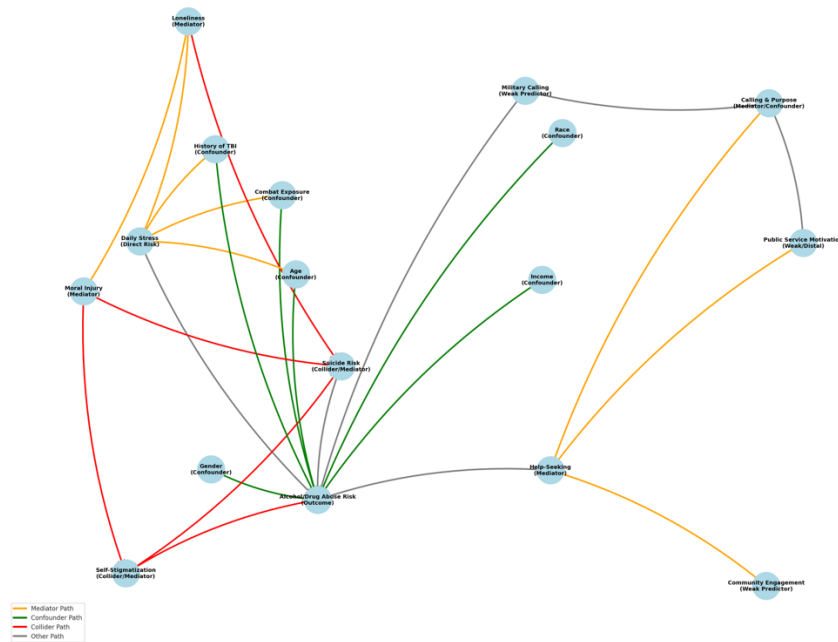


Figure 4: Causal Interference Pattern for Protective and Risk Factors and Confounders on Alcohol and Substance Abuse Risk

DISCUSSION

Daily stress. This ever-present condition is often overlooked due to its widespread prevalence. We have normalized it because many feel nothing can be done. However, it is well understood that stress can harm physical and mental health (O'Connor et al., 2021). The veteran population is highly vulnerable to stress (Johnson et al., 2011; Schafer et al., 2024). Therefore, it is imperative to conduct research on veterans and stress.

Military service has long been associated with various mental health challenges, including PTSD, depression, anxiety, substance use disorders (SUDs), and chronic physical conditions such as musculoskeletal injuries, cardiovascular issues, and sleep disorders

(Desmarais & Cacace, 2022). SUDs are a public health challenge and among the most common and costly health conditions for US veterans (Lan et al., 2015). The Department of Defense found that more than 80% of Service Members (SM) consume alcohol and 40% engaged in binge drinking in the previous 30 days, compared to 55% and 27% of the general public, respectively (Hoopsick et al., 2022). Despite this, few studies have been conducted on the protective and risk factors contributing to alcohol and substance abuse risk (ASAR), as well as the buffering effect of protective factors on risk factors. This study examined these complex relationships in greater detail. The structure of the analysis was modeled after the buffering hypothesis for suicide (Johnson et al., 2011).

A priori, it was expected that overall wellness and purpose and calling would have the greatest indirect impact on ASAR. In contrast, combat exposure and suicidality would have the greatest direct impact on ASAR use among US veterans. However, this was not the case.

The correlations between the variables, direct or indirect, were as expected. The ASAR was not correlated with any single variable but was correlated in the overall model. The protective factors consistently had low coefficients across all models in the stepwise linear regression analysis. Furthermore, they did not appreciably alter the β coefficients of the risk factors, indicating that they did not mitigate them. The analysis also revealed that daily stress was the largest contributor to ASAR in veterans across all risk and combined models, with and without confounders.

IMPACT

Much of the literature is on the association of posttraumatic stress with alcohol and substance abuse, and not on daily stress (Back et al., 2014). Although research has shown that “interpersonal tensions and network stressors were unique predictors of physical and mental

health outcomes” (Schafer et al., 2024), no research has been conducted on the association between daily stress and ASAR. Thus, the findings of this study offer a new perspective and suggest that further research is necessary, particularly in the area of daily stress. This has a significant clinical impact on prevention in veterans.

Daily stress is a common thread that unites everyone and can serve as a foundational bridge. There is a substantial body of literature on the importance of the doctor-patient relationship (Benedetti, 2013; Oh Nelson, 2021). Providers’ words have an impact (Benedetti, 2002). Instead of negatively phrased questions like, “Do you feel sad?”, the use of open-ended, positively phrased questions, such as “What is optimistic in your daily life?”, can foster trustworthy relationships. A paradigm shift in the clinical encounter is necessary. Changes in wording, the depth of the conversation, and more emphasis on daily stress will promote healthy therapeutic alliances leading to better outcomes and the prevention of ASAR. This study’s findings can be used to inform policy, educate providers, and support the conversational “daily stress” framework needed in the clinical encounter.

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Appendix

Table 1: Descriptive Statistics

Variable	N	Median (Q1, Q3)	Frequency (%)
Age (years)	1495	54.0 (18.0, 86.0)	
Branch			
<i>Air Force/Air Force Reserve</i>			366 (24.5%)
<i>Air National Guard</i>			36 (2.4%)
<i>Army/Army Reserve</i>			491 (32.8%)
<i>Army National Guard</i>			115 (7.7%)
<i>Coast Guard/Coast Guard Reserve</i>			42 (2.8%)
<i>Marine Corps/Marine Corps Reserve</i>			122 (8.2%)
<i>Navy/Navy Reserve</i>			323 (21.6%)
Employed (yes)	1495		
No			604 (40.4%)
Yes			891 (59.6%)
Gender	1495		
Male			1004 (67.2%)
Female			483 (32.3%)
Other			8 (0.5%)
Income (USD)	1495	\$60,000 (\$0.0, \$1.5M)	
Income without outliers (USD)	1495	\$59,000 (\$0.0, \$200,000)	
Length of Service (years)	1495	6.0 (0.03, 40.0)	
Marital Status	1495		
Single			282 (18.9%)
Married			886 (59.3%)
Domestic Partnership			73 (4.9%)
Divorced			211 (14.1%)
Widowed			43 (2.9%)
Race	1495		
White			1129 (75.5%)
Black			215 (14.4%)
Hispanic			86 (5.8%)
Asian			42 (2.8%)
American Indian/Alaska Native			13 (0.9%)
Native Hawaiian/Other Pacific Islander			10 (0.7%)
Region			
Southeast			507 (33.9%)
Northeast			262 (17.5%)
Midwest			272 (18.2%)
West			295 (19.7%)
Southwest			159 (10.7%)
Number of Years Since Discharge from 2022 (years)	1495	21.0 (0.0, 45.0)	

Table 2: Variance Inflation Factors (VIP)

Measures	Variance Inflation Factors
Protective Factors	
Calling and Purpose	1.594
Community Engagement	2.388
Help-Seeking Behavior	1.359
Military Calling	1.531
Quality of Life	2.628
Public Service Motivation	2.038
Overall Wellness	3.385
Risk Factors	
Combat Exposure	1.193
Daily Stress	1.349
Loneliness	1.472
Moral Injury	2.052
Self-Stigmatization	1.299
Suicide Risk	1.448
History of Traumatic Brain Injury	1.075

Table 3: Pearson's Correlation Table Between Risk Factors and Alcohol and Substance Abuse Risk

	Alcohol and Drug Abuse Risk	Purpose in Life	Social Support	Help-Seeking Behaviors	Military Identity	Quality of Life	Public Service Motivation	Overall Wellness	Combat Exposure	Daily Stress	Loneliness	Moral Injury	Self-Stigma	Suicidal Ideation	TBI	Age	Gender	Race	Income
Alcohol and Drug Abuse Risk	1																		
Purpose in Life	-0.01	1																	
Social Support	-0.22	0.28	1																
Help-Seeking Behaviors	0	0.29	0.46	1															
Military Identity	-0.06	0.36	0.2	0.22	1														
Quality of Life	-0.33	0.17	0.61	0.28	0.13	1													
Public Service Motivation	0.01	0.59	0.23	0.29	0.58	0.11	1												
Overall Wellness	-0.34	0.27	0.71	0.29	0.2	0.78	0.22	1											
Combat Exposure	0.24	0.01	-0.01	0.14	0.02	-0.13	0.11	-0.14	1										
Daily Stress	0.36	-0.04	-0.15	0.03	-0.1	-0.33	0.01	-0.32	0.31	1									
Loneliness	0.33	0	-0.47	-0.19	-0.05	-0.59	0.02	-0.58	0.2	0.33	1								
Moral Injury	0.42	-0.18	-0.51	-0.14	-0.2	-0.62	-0.13	-0.7	0.33	0.44	0.54	1							
Self-Stigma	0.22	-0.21	-0.2	0.01	-0.41	-0.22	-0.27	-0.31	0.25	0.3	0.23	0.46	1						
Suicidal Ideation	0.4	-0.07	-0.39	-0.12	-0.09	-0.53	-0.02	-0.53	0.22	0.33	0.41	0.51	0.21	1					
TBI	0.14	0	-0.13	-0.04	0.01	-0.22	0.02	-0.16	0.18	0.18	0.16	0.19	0.1	0.2	1				
Age	-0.25	0.06	0.08	-0.16	0.13	0.18	0.03	0.28	-0.43	-0.43	-0.26	-0.41	-0.4	-0.25	-0.1	1			
Gender	-0.01	0.05	-0.03	0.03	-0.05	-0.11	-0.01	-0.1	-0.07	0.1	0.11	0.08	0	0.18	0.01	-0.15	1		
Race	0.09	0.05	0	0.04	-0.11	-0.04	-0.06	-0.02	0.1	0.09	0.04	0.09	0.1	0.07	-0.01	-0.15	0.08	1	
Income	-0.09	0	0.2	0.07	0.05	0.26	0.06	0.2	0.1	-0.01	-0.18	-0.13	-0.05	-0.12	-0.05	0.05	-0.16	-0.07	1

Table 4: Comparative Chart of the β Coefficients Protective and Risk Factors Independently Associated with Alcohol and Drug Abuse Risk using Multiple Linear Regression among Veterans (N = 1,495)

Measures	Model 1 β	Model 2 β	Model 1a β	Model 3 β	Model 3a β	Model 5 β	Model 6	Model 5a	Model 6a
Constant	2.999	3.358	3.609	-0.787	-0.403	-1.109	-1.27	-0.726	-0.2042
Calling and Purpose	0.011		0.019			0.020	0.018	0.016	
Community Engagement	0.001		-0.004			0.001	0.001	0.002	
Help-Seeking Behavior	0.031	0.036	0.017			0.014	0.014	0.015	
Military Calling	-0.020		-0.008			0.004	0.005	0.003	
Quality of Life	-0.013	-0.014	-0.016			-0.001	-0.001	-0.002	
Public Service Motivation	0.021		0.016			-0.005	-0.004	-0.002	
Overall Wellness	-0.016	-0.015	-0.010			-0.001	-0.001	-0.000	
Combat Exposure				0.015	0.012	0.014	0.014	0.011	
Daily Stress				0.121	0.129	0.115	0.116	0.124	0.134
Loneliness				0.054	0.052	0.049	0.049	0.048	0.053
Moral Injury				0.014	0.013	0.014	0.014	0.013	0.014
Self-Stigmatization				0.004	0.001	0.007	0.007	0.004	
Suicide Risk				0.076	0.081	0.075	0.075	0.081	0.082
History of Traumatic Brain Injury				0.014	0.011	0.018	0.023	0.014	
Confounders									
Age			0.015		-0.001		0.001	-0.000	-0.003
Gender (Male vs. Female vs. Other)			-0.223		-0.027		0.106	0.271	-0.029

*Denotes when the **p-value** < 0.05

Table 5: Effect Size for Overall Model (Cohen's f^2) and Individual Protective and Risk Factors (Semi-partial Correlation Squared)

Variables	Effect Size (sr^2)	Interpretation
Protective Factors		
Calling and Purpose	0.0083	Very small
Community Engagement	0.0002	Negligible
Help-Seeking Behavior	0.015	Small
Military Calling	0.0003	Negligible
Quality of Life	0.0026	Very small
Public Service Motivation	0.0001	Negligible
Overall Wellness	0.0002	Negligible
Risk Factors		
Combat Exposure	0.0155	Small
Daily Stress	0.1541	Medium to large
Loneliness	0.0243	Small
Moral Injury	0.0773	Medium
Self-Stigmatization	0.0016	Very small
Suicide Risk	0.2313	Large
History of Traumatic Brain Injury	0.0001	Negligible
Confounders		
Age	0	Negligible
Gender	0.0785	Medium
Race	0.0151	Small
Income	0.0088	Very small
Cohen's f^2 Overall Model Effect Size	0.3660	Large