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# Does Alcohol Misuse Differ by Gender and Veteran Status in Adults Ages 25 and Older?

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## Abstract

**Purpose:** Research shows conflicting findings for prevalence of alcohol use, binge drinking, and heavy drinking between veteran males and females, and as compared to civilians. The purpose of this study was to assess whether alcohol use, binge drinking, and heavy drinking differ by veteran and gender status in adults ages 25 and older in the general population.

**Methods:** This cross-sectional analysis used 2015 data from the Behavioral Risk Factor Surveillance System (BRFSS) for males and females ages 25 and older in Alaska, Maine, Montana, Oregon, and South Carolina. Separate multiple logistic regression analyses by state were used to assess patterns in relationships between alcohol outcomes and veteran and gender status while controlling for demographic factors, depression, and tobacco use.

**Results:** About half of male and female adults 25 and older reported alcohol use, and few reported binge drinking or heavy drinking. Across all states, both veteran and non-veteran males reported more alcohol use and binge drinking than female non-veterans. In addition, binge drinking and heavy drinking showed moderate to high relations to smoking in all 5 states.

**Conclusion:** The results of adjusted analyses indicated that in all five states, alcohol use and binge drinking differed significantly by veteran and gender status. In addition, binge drinking and heavy drinking were significantly related to smoking in all 5 states. For adults ages 25 years and older in a primary care setting, providers may expect a moderate prevalence of alcohol use, and low prevalences of binge drinking, heavy drinking, and smoking. Standard of care is to automatically screen for alcohol use and tobacco use in all patients. However, if signs of either alcohol misuse or smoking are present, especially among males, providers should consider screening for alcohol misuse.

**Keywords:** Prevalence of alcohol; Behavioral risk factor; Veteran and gender status; Depression; Tobacco use

## Introduction

Excessive alcohol use leads to about 88,000 deaths in the United States each year, and shortens the life of those who die by almost 30 years. In addition, excessive drinking costs the United States \$249 billion in 2010 [1]. Alcohol use disorders are one of the most common and expensive of all health conditions among US veterans [2].

Research has shown that alcohol misuse is related to demographic and health factors within United States military personnel and veterans. For example, military personnel who are married are less likely to have alcohol use disorders than those who are separated or divorced [3]. In addition, military personnel and veterans with less education and lower income levels are more likely to have alcohol use disorders [3,4]. Furthermore, in U.S. veteran males, non-Hispanic blacks have the highest incidence of alcohol use disorders, followed by Hispanics, then non-Hispanic whites with the lowest prevalence; however, in veteran women, Hispanics had the lowest prevalence of alcohol use disorders [5]. Other research shows that active duty personnel and veterans with mental health issues such as depression, anxiety, and PTSD, as well as those who use tobacco are at increased risk for alcohol misuse [4,6-10].

Veteran and gender status may also be related to alcohol misuse. For example, research shows that veteran and non-veteran female rates of alcohol use and misuse are similar [7]; however, other research indicates that veteran males may be less likely to report binge drinking but more likely to report heavy drinking than non-veteran males [8]. Additionally, research indicates that veteran males may be more likely than veteran females to report heavy drinking [9]; however, other research indicates that gender is not significantly related to prevalence of alcohol use [10].

In addition to the limited studies and conflicting findings, much of the research assessing alcohol use and misuse in U.S. veterans uses data from veteran services [5,7]. As such, prevalence for alcohol misuse between male and female veterans and between veterans and civilians in general populations may be unclear. This information would be useful

for identifying at-risk groups not utilizing veteran services so that early interventions can be implemented. Therefore, the purpose of this study was to determine whether alcohol use, binge drinking, and heavy drinking differ by veteran and gender status in U.S. adults ages 25 and older in the general population.

## Methods

### Design

This cross-sectional analysis used data from the 2015 Behavioral Risk Factor Surveillance System (BRFSS) [11]. BRFSS is a system of health-related telephone surveys using random digit dialing techniques conducted by the CDC that collect state data about U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services. BRFSS collects data in all 50 states as well as the District of Columbia and three U.S. territories and completes more than 400,000 adult interviews each year.

### Sample

The sample included veteran and non-veteran males and females ages 25 and older in Alaska (N=3451), Maine (N=8745), Montana (N=5742), Oregon (N=5059), and South Carolina (N=11005). These states were chosen because of their higher percentages of veterans and of reported binge and heavy drinking than other states [11]. This study was given exempt status by the Institutional Review Board at The University of North Texas Health Science Center.

### Data

Alcohol outcomes included alcohol use, binge drinking, and heavy drinking. Alcohol use was measured as yes/no having had at least one drink of alcohol in the past 30 days. Binge drinking was measured as yes/no having had 5 or more drinks on one occasion for males and 4 or more drinks on one occasion for females in the past 30 days. Heavy drinking was measured as yes/no having had more than 14 drinks per week for males and more than 7 drinks per week for females in the past 30 days. The factor of interest, veteran and gender status was categorized as non-veteran female, veteran female, non-veteran male, or veteran male.

Control variables included age, education level, income level, marital status, race, depression, and tobacco use. Age was categorized as 25-34, 35-44, 45-54, 55-64, and 65 and older. Education level was dichotomized as "graduated college or technical school" or "did not graduate college or technical school." Annual income level was categorized as "\$0 to less than \$25,000," "\$25,000 to less than \$50,000," or "\$50,000 or more."

Marital status was categorized as "married" or "not married." Because the vast majority of participants were white, race was categorized as "white, non-Hispanic" versus "other." Depression was measured as "ever" or "never" in response to the BRFSS question, "Have you ever been told that you have a depressive disorder, including depression, major depression, dysthymia, or minor depression?" Tobacco use was measured as "current smoker" versus "non-smoker." Descriptive statistics and categories for all variables are shown in Table 1.

**Table 1:** Sample characteristics by state.

| Variables                     | Alaska N=3451 |     | Maine N=8745 |     | Montana N=5742 |     | Oregon N=5059 |     | South Carolina N=11005 |     |
|-------------------------------|---------------|-----|--------------|-----|----------------|-----|---------------|-----|------------------------|-----|
|                               | N             | %   | N            | %   | N              | %   | N             | %   | N                      | %   |
| <b>Alcohol use (Total)</b>    | 3313          | 96  | 8447         | 97  | 5551           | 97  | 4768          | 94  | 10575                  | 96  |
| Yes                           | 1790          | 54  | 4820         | 57  | 2976           | 54  | 2824          | 59  | 4674                   | 44  |
| No                            | 1523          | 46  | 3627         | 43  | 2575           | 46  | 1944          | 41  | 5901                   | 56  |
| <b>Binge drinking (Total)</b> | 3267          | 95  | 8393         | 96  | 5494           | 96  | 4726          | 93  | 10470                  | 95  |
| Yes                           | 497           | 15  | 925          | 11  | 728            | 13  | 584           | 12  | 1072                   | 10  |
| No                            | 2770          | 85  | 7468         | 89  | 4766           | 87  | 4142          | 88  | 9398                   | 90  |
| <b>Heavy drinking (Total)</b> | 3267          | 95  | 8403         | 96  | 5496           | 96  | 4706          | 93  | 10457                  | 95  |
| Yes                           | 237           | 7   | 607          | 7   | 351            | 6   | 340           | 7   | 570                    | 5   |
| No                            | 3030          | 93  | 7796         | 93  | 5145           | 94  | 4366          | 93  | 9887                   | 95  |
| <b>Veteran status (Total)</b> | 3443          | 100 | 8737         | 100 | 5732           | 100 | 5044          | 100 | 10971                  | 100 |
| Non-veteran female            | 1805          | 52  | 5090         | 58  | 3128           | 55  | 2777          | 55  | 6255                   | 57  |
| Veteran female                | 68            | 2   | 117          | 1   | 75             | 11  | 69            | 1   | 165                    | 2   |
| Non-veteran male              | 1070          | 31  | 2400         | 28  | 1636           | 29  | 1504          | 30  | 2936                   | 27  |
| Veteran male                  | 500           | 15  | 1130         | 13  | 893            | 16  | 694           | 14  | 1615                   | 15  |
| <b>Age (Total)</b>            | 3451          | 100 | 8745         | 100 | 5742           | 100 | 5059          | 100 | 11005                  | 100 |

|                                |      |    |      |     |      |     |      |    |       |     |
|--------------------------------|------|----|------|-----|------|-----|------|----|-------|-----|
| <b>25–34</b>                   | 456  | 13 | 626  | 7   | 509  | 9   | 510  | 10 | 1000  | 9   |
| <b>35–44</b>                   | 495  | 14 | 940  | 11  | 569  | 10  | 615  | 12 | 1322  | 12  |
| <b>45–54</b>                   | 709  | 21 | 1492 | 17  | 868  | 15  | 803  | 16 | 1859  | 17  |
| <b>55–64</b>                   | 898  | 26 | 2301 | 26  | 1476 | 26  | 1133 | 22 | 2486  | 23  |
| <b>65 or older</b>             | 893  | 26 | 3386 | 39  | 2320 | 40  | 1998 | 39 | 4338  | 40  |
| <b>Education level (Total)</b> | 3431 | 99 | 8718 | 100 | 5723 | 100 | 5025 | 99 | 10972 | 100 |
| <b>Graduated</b>               | 1333 | 39 | 3428 | 39  | 2062 | 36  | 2052 | 41 | 3537  | 32  |
| <b>Did not graduate</b>        | 2098 | 61 | 5290 | 61  | 3661 | 64  | 2973 | 59 | 7435  | 68  |
| <b>Income level (Total)</b>    | 3096 | 90 | 7794 | 89  | 4724 | 82  | 4139 | 82 | 9000  | 82  |
| <b>0 - &lt;\$25,000</b>        | 652  | 21 | 2142 | 27  | 1274 | 27  | 1042 | 25 | 2814  | 31  |
| <b>\$25,000 - &lt;\$50,000</b> | 627  | 20 | 2075 | 27  | 1428 | 30  | 1090 | 26 | 2424  | 27  |
| <b>\$50,000+</b>               | 1817 | 59 | 3577 | 46  | 2022 | 43  | 2007 | 48 | 3762  | 42  |
| <b>Marital status (Total)</b>  | 3420 | 99 | 8705 | 100 | 5715 | 100 | 4978 | 99 | 10940 | 99  |
| <b>Married</b>                 | 1962 | 57 | 4887 | 56  | 3281 | 57  | 2780 | 56 | 6007  | 55  |
| <b>Not married</b>             | 1458 | 43 | 3818 | 44  | 2434 | 43  | 2198 | 44 | 4933  | 45  |
| <b>Race (Total)</b>            | 3361 | 97 | 8629 | 99  | 5650 | 98  | 4944 | 98 | 10742 | 98  |
| <b>White, non-Hispanic</b>     | 2436 | 72 | 8359 | 97  | 4962 | 88  | 4283 | 87 | 7553  | 70  |
| <b>Other</b>                   | 925  | 28 | 270  | 3   | 688  | 12  | 661  | 13 | 3189  | 30  |
| <b>Depression (Total)</b>      | 3429 | 99 | 8715 | 100 | 5711 | 99  | 5026 | 99 | 10931 | 99  |
| <b>Ever diagnosed</b>          | 531  | 15 | 1974 | 23  | 1114 | 20  | 1280 | 25 | 2141  | 20  |
| <b>Never diagnosed</b>         | 2898 | 85 | 6741 | 77  | 4597 | 80  | 3746 | 75 | 8790  | 80  |
| <b>Tobacco use (Total)</b>     | 3348 | 97 | 8523 | 97  | 5598 | 97  | 4829 | 95 | 10648 | 97  |
| <b>Current smoker</b>          | 597  | 18 | 1255 | 15  | 867  | 15  | 663  | 14 | 1688  | 16  |
| <b>Non-smoker</b>              | 2751 | 82 | 7268 | 85  | 4731 | 85  | 4166 | 86 | 8960  | 84  |

## Analysis

Frequency distributions were used to assess sample characteristics and identify any issues with the distribution of variables. Data from multiple states was used separately to determine patterns among variable relations across similar samples. Multiple logistic regression analyses by state were used to assess the relationship between alcohol misuse (separately for use, binge, and heavy) by veteran and gender status after controlling for demographic factors, depression, and tobacco use.

Any observations with missing data for any variable were removed from the multivariate models. The adjusted results for alcohol outcomes and veteran and gender status are shown in Table 2. All statistical analyses were conducted using R version 3.3.3 (2017-03-06; Copyright (C) 2017 The R Foundation for Statistical Computing).

## Results

### Descriptive

Participant characteristics are shown in Table 1. Across states for alcohol outcomes, about half of participants reported any alcohol use (44-59%), and fewer reported binge drinking (10-15%) or heavy drinking (5-7%). For veteran and gender status across states, about half were non veteran female (52-58%) and far fewer were veteran female (1-11%) or veteran male (13-16%).

Overall, most participants were white, non-Hispanic (70-97%) and ages 45 and older (73-83%), who reported no depression diagnosis (77-85%) or smoking (82-85%). In addition, the majority was married (55-57%), had graduate college or technical school (59-68%), and reported an annual income of \$50,000 or more (42-59%).

**Table 2:** Results of multiple logistic regression for alcohol outcomes by state.

| Models                | Alcohol Use a |            | Binge Drinking a |            | Heavy Drinking a |            |
|-----------------------|---------------|------------|------------------|------------|------------------|------------|
|                       | AOR           | 95% CI     | AOR              | 95% CI     | AOR              | 95% CI     |
| <b>Alaska</b>         |               |            |                  |            |                  |            |
| Non-veteran female    | Ref           | -          | -                | Ref        | -                | -          |
| Veteran female        | 0.95          | 0.53, 1.71 | 0.84             | 0.34, 2.06 | 0.36             | 0.09, 1.54 |
| Non-veteran male      | 1.63          | 1.36, 1.95 | 2.51             | 1.99, 3.16 | 0.92             | 0.67, 1.26 |
| Veteran male          | 1.46          | 1.15, 1.84 | 1.45             | 1.03, 2.05 | 0.53             | 0.31, 0.88 |
| <b>Maine</b>          |               |            |                  |            |                  |            |
| Non-veteran female    | Ref           | -          | -                | Ref        | -                | -          |
| Veteran female        | 0.64          | 0.42, 0.97 | 0.76             | 0.34, 1.69 | 0.41             | 0.15, 1.15 |
| Non-veteran male      | 1.45          | 1.29, 1.63 | 2.57             | 2.18, 3.03 | 0.91             | 0.74, 1.11 |
| Veteran male          | 1.47          | 1.26, 1.72 | 2.12             | 1.66, 2.71 | 0.87             | 0.66, 1.16 |
| <b>Montana</b>        |               |            |                  |            |                  |            |
| Non-veteran female    | Ref           | -          | -                | Ref        | -                | -          |
| Veteran female        | 1.01          | 0.60, 1.69 | 0.79             | 0.33, 1.89 | 0.23             | 0.32, 1.67 |
| Non-veteran male      | 1.58          | 1.37, 1.83 | 2.36             | 1.94, 2.86 | 1.28             | 0.98, 1.68 |
| Veteran male          | 1.29          | 1.08, 1.54 | 1.87             | 1.43, 2.45 | 1.12             | 0.79, 1.60 |
| <b>Oregon</b>         |               |            |                  |            |                  |            |
| Non-veteran female    | Ref           | -          | -                | Ref        | -                | -          |
| Veteran female        | 1.82          | 0.98, 3.39 | 1.54             | 0.68, 3.48 | 1.39             | 0.61, 3.61 |
| Non-veteran male      | 1.3           | 1.11, 1.53 | 1.84             | 1.49, 2.28 | 1.65             | 0.64, 1.13 |
| Veteran male          | 1.29          | 1.05, 1.59 | 1.78             | 1.30, 2.45 | 1.44             | 0.66, 1.81 |
| <b>South Carolina</b> |               |            |                  |            |                  |            |
| Non-veteran female    | Ref           | -          | -                | Ref        | -                | -          |
| Veteran female        | 1.03          | 0.72, 1.49 | 0.5              | 0.23, 1.10 | 1.39             | 0.69, 2.82 |
| Non-veteran male      | 1.72          | 1.54, 1.92 | 2.54             | 2.17, 2.98 | 1.65             | 1.34, 2.03 |
| Veteran male          | 1.7           | 1.49, 1.95 | 2.05             | 1.65, 2.56 | 1.44             | 1.10, 1.88 |

Note: Ref=referent group; AOR=adjusted odds ratio; 95% CI=95% confidence interval; Bolded results are significant (AORs with 95% CI that do NOT include 1.0 are significant a Models by state adjusted for age, education level, income level, marital status, race, depression, and tobacco use).

## Adjusted

As shown in Table 2, the results of multiple logistic regression analyses showed that alcohol use and binge drinking differed significantly by veteran and gender status in all five states. Compared to female non veterans, alcohol use was about 1.5 to 2 times more likely to be reported by non-veteran males and by veteran males across states. In addition, across states, binge drinking was about 1.5 to 2.5 times more likely to be reported by non-veteran males and veteran males when compared to non-veteran females. Overall, there was no pattern across states for heavy drinking by veteran and gender status.

The results also indicated that binge drinking and heavy drinking differed by tobacco use in all five states (not shown in Table 2). Compared to non-smokers, current smokers were 2.09 to 2.95 times more likely to report binge drinking (Alaska:

OR=2.95, 95% CI=2.27, 3.83, large effect size; Maine: OR=2.45, 95% CI=2.02, 2.97, moderate effect size; Montana: OR=2.09, 95% CI=1.67, 2.61, moderate effect size; Oregon: OR=2.69, 95% CI=2.09, 3.47, large effect size; South Carolina: OR=2.52, 95% CI=2.12, 3.00, large effect size). In addition, current smokers were 2.61 to 3.25 times more likely to report heavy drinking than nonsmokers (Alaska: OR=3.25, 95% CI=2.30, 4.58, large effect size; Maine: OR=2.94, 95% CI=2.35, 3.67, large effect size; Montana: OR=2.61, 95% CI=1.95, 3.49, large effect size; Oregon: OR=3.20, 95% CI=2.34, 4.36, large effect size; South Carolina: OR=2.78, 95% CI=2.23, 3.47, large effect size).

## Discussion

The purpose of this study was to assess whether alcohol use, binge drinking, and heavy drinking differed by veteran and

gender status in U.S. adults ages 25 and older in the general population. Across the five states, about half of participants reported alcohol use (44-59%), and few reported binge drinking (10-15%) or heavy drinking (5-7%). The results of multiple logistic regression indicated that in all five states, non-veteran males and veteran males were more likely to report alcohol use and binge drinking than non-veteran females, while there were no patterns for veteran females or for heavy drinking. Our findings that alcohol use and misuse differed by gender but not by veteran status in the United States contradict results from previous studies showing that male veterans were less likely to report binge drinking but more likely to report heavy drinking than non-veteran males [8] and veteran males were more likely to report heavy drinking than veteran females [9]. These findings are also inconsistent with research findings indicating that gender was not significantly related to prevalence of alcohol use [10].

Our differing results could be due to variations in the assessment of alcohol misuse, data sources, and target populations [2,7]. Our study used self-reported drink count for veterans and non-veterans in the general population, whereas other research uses patient data from Veterans Affairs and diagnostic criteria for substance abuse [2,5,7]. In their systematic review of substance use rates among veterans, Lan et al. [2] found that research using diagnostic criteria report higher prevalence rates of substance use disorders among veterans than do studies using general questions. However, our results may also support a lowering trend of reported alcohol misuse among veterans. Lan et al. [2] also found that rates of substance abuse among US veterans have declined over time. Therefore, any previous differences in veteran and non-veteran alcohol use, especially by gender, may not be the case any longer. In most research, males report higher alcohol use and misuse rates than females and our results indicate that as well. In addition, current smoking was also found to be significantly related to alcohol misuse (binge and heavy) in this study, which is consistent with prior research [5].

## Limitations

The BRFSS data allowed use of large similar general population samples for assessing patterns among variable relations. However, BRFSS data is cross-sectional, lacks in-depth questioning on topics, and is collected through telephone self-report, which can lead to sample bias, recall bias, and social desirability bias. Interestingly, initial primary care provider information from each patient may be similar—information from patients willing to go for medical care (sample bias) who briefly self-report an overview of their health history, behaviors, and symptoms at one time point (cross-sectional, lack of detail, recall bias, and social desirability bias)—but the provider still has to act on the information provided. With more and more veterans acquiring medical care outside of the Veteran Administration [12,13], our purpose was to assess patterns of relations over similar samples to add to the evidence from which to base medical questioning and decision-making about whether or not veteran status should be a strong consideration for alcohol misuse in general practice.

Additionally, the BRFSS data did not include variables such as physical violence, sexual trauma, PTSD, and other mental health disorders, which were found in previous studies to be related to substance use for veterans [7,10,14-16]. Research indicates that if substance use problems are related to trauma, then treating substance use independently will not be as successful as providing integrated care for trauma and substance use [14-16]. Trauma may be related to alcohol use in civilian populations as well, so future research should include trauma-related factors in assessing differences in alcohol outcomes among veterans and non-veterans in the general population. Furthermore, there were very small percentages of female veterans in this study. Future research assessing differences in alcohol outcomes by veteran and gender status needs to include more female veterans from the general population.

## Conclusion

The results of this population based-study may be generalizable to adults ages 25 and older, including veterans and non-veterans, in a primary care setting. For this target population, there may be moderate levels of alcohol use (44-59%) and low levels of binge drinking (10-15%), heavy drinking (5-7%), and smoking (14-18%). This study found significant and consistent patterns across multiple samples that indicate that both veteran and non-veteran males may be more likely to report alcohol use and binge drinking, and that current smokers are more likely to report binge drinking and heavy drinking. For primary care providers, the standard of care is to screen automatically for alcohol and tobacco use in all patients. However, if signs of alcohol or tobacco use are present, especially in males, providers should consider a more in-depth screen for alcohol misuse. Patient education and resources for substance use treatment should be provided as needed and providers should be aware of veteran services in their area. In addition, primary care providers may also want to screen for unresolved past trauma so that any co-occurring mental health and substance issues can be identified and referrals can be made to integrated care settings.

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