



Age moderates the association of depressive symptoms and unhealthy alcohol use in the National Guard



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HIGHLIGHTS

- Depression, sex, and deployment did not predict Guardsmen's unhealthy drinking.
- Guardsmen's depressive symptoms and unhealthy drinking depend on age.
- Depression is related to unhealthy drinking only for Guardsmen over 33 years old.
- SBIRT with Guardsmen appears effective in identifying unhealthy drinking.

ARTICLE INFO

Article history:

Received 22 December 2015

Received in revised form 1 July 2016

Accepted 15 July 2016

Available online 17 July 2016

Keywords:

Unhealthy drinking

Mood disorders

Guardsmen

SBIRT

ABSTRACT

Unhealthy drinking is a significant problem contributing to poor health and performance of military personnel. The Iowa Army National Guard and the Iowa Department of Public Health have collaborated with the Substance Abuse and Mental Health Administration to better identify unhealthy substance use via Screening, Brief Intervention, and Referral to Treatment program (SBIRT). Yet, little research has been conducted on the Guard's use of SBIRT. This study examined depression, age, deployment status, and sex as factors contributing to unhealthy drinking. Of the Guardsmen who took part in SBIRT, 3.7% ($n = 75$) met the criteria for unhealthy drinking and 3.9% ($n = 78$) had some level of depression. The overall multivariate model significantly predicted unhealthy drinking ($\chi^2(5) = 41.41, p < 0.001$) with age moderating the association of depressive symptoms and unhealthy alcohol (Wald $\chi^2(1) = 7.16, p = 0.007$). These findings add to the existing understanding of factors contributing to unhealthy drinking suggesting the association between the presence of depression and unhealthy drinking depends on age of the Guardsman. This age and depression interaction may be an important diagnostic feature to consider for unhealthy drinking in the Guard. Furthermore, previous research on the general military population finds similar percentages, providing support for SBIRT as an effective screening tool in the Guard.

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1. Introduction

Problem substance use in the military is a significant problem contributing to poor health and performance of personnel. The Department of Defense (DoD) has enacted a health promotion initiative aimed at increasing positive health behaviors while decreasing negative health behaviors to include drug abuse and excessive alcohol use (DoD, 2014).

Major preventive advances have been made in the reduction of military tobacco and illicit substance use; yet, unhealthy drinking continues to increase (Bray, Pemberton, Lane, Hourani, & Mattiko, 2010). Unhealthy drinking may consist of binge drinking or heavy drinking. Binge drinking is defined as drinking at least five drinks on one occasion at least one time in the past 30 days (SAMHSA, 2015). Heavy drinking is defined by drinking at least five drinks on one occasion, on at least five or more days in the past 30 days (SAMHSA, 2015).

In the general US population it is estimated that 56% of adults drink alcohol (Dwyer-lindgren et al., 2015) and 14% demonstrate past-year unhealthy drinking (Dawson, Grant, Stinson, & Zhou, 2005). Among all active-duty military personnel, approximately 45% demonstrate past-year moderate to heavy drinking (Mattiko, Olmsted, Brown, & Bray,

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2011). Many other studies have noted problems with binge and heavy drinking in the military, although this is not directly comparable as they measure past-month use (Bray et al., 2010; Jacobson et al., 2008; Lande, Marin, Chang, & Lande, 2008; Seal et al., 2009; Stahre, Brewer, Fonseca, & Naimi, 2009). The associations between the military and past-year drinking in the literature, along with the disparity between the general US population and active-duty military drinking behaviors, suggest needed research in enhanced screening and brief intervention to assess for unhealthy drinking among other sectors of military personnel.

Active-duty military personnel and the National Guard (NG) have similar levels of alcohol use disorders; 1.1% and 1.7% respectively (Seal et al., 2009). In the NG, heavy and binge drinking is associated with age (Ferrier-Auerbach et al., 2009; Vander Weg, DeBon, Sherrill-Mittleman, Klesges, & Relyea, 2006; Waller, Mcguire, & Dobson, 2015), deployment status (Ferrier-Auerbach et al., 2009; Jacobson et al., 2008), sex (Jacobson et al., 2008; Vander Weg et al., 2006), and depression (Ferrier-Auerbach et al., 2009; Jacobson et al., 2008). For instance, younger guardsmen and those over the age of 21 are associated with increased drinking (Ferrier-Auerbach et al., 2009; Vander Weg et al., 2006). Being previously deployed is noted in increasing the risk of heavy drinking and binge drinking behaviors and may be attributed to coping with transitioning to civilian life after combat (Jacobson et al., 2008). In addition, only the anticipation of an upcoming deployment may lead to increased drinking (Ferrier-Auerbach et al., 2009). Women are associated with increased heavy drinking, but men are associated with increased binge drinking after seeing combat (Jacobson et al., 2008). Furthermore, the presence of depressive symptoms are associated with the onset of new heavy and binge drinking behaviors after seeing combat (Jacobson et al., 2008), and increased drinking frequency prior to deployment (Ferrier-Auerbach et al., 2009). Yet, interactions are unexplored among the known associations with drinking in the NG and may provide important clinical evidence informing of assessment, intervention, and referrals to treatment.

In an effort to address substance use behaviors, the Iowa Army National Guard (IANG) and the Iowa Department of Public Health (IDPH) have collaborated with the Substance Abuse and Mental Health Administration (SAMHSA) to better identify unhealthy substance use and provide appropriate interventions (SAMHSA, 2014). SAMHSA introduced a large-scale public health approach to screening, intervening, and effectively referring patients with substance use problems. The Screening, Brief Intervention, and Referral to Treatment (SBIRT) program uses motivational interviewing, brief intervention, and referrals, which may be an important factor in increasing perceived incentives to change (Madras et al., 2009). SBIRT is functioning in federally funded medical facilities, which include residency cooperative agreements, state cooperative agreements, colleges, and universities. Yet, there is little research conducted on the NG's use of SBIRT to investigate correlates predictive of unhealthy alcohol use since the collaboration began in 2012. SBIRT was designated as a potential intervention strategy for use as a means of indicated prevention (Witkiewitz & Estrada, 2011). Currently, the IDPH SBIRT program is working in partnership with the IANG. SBIRT Iowa uses brief intervention using motivational interviewing, brief treatment (5–12 sessions) using motivational enhancement and cognitive behavioral techniques aligned with the American Society of Addiction Medicine criteria for early intervention, and referral to treatment to Iowa substance use treatment facilities (Iowa Department of Public Health, 2012).

The present study seeks to explore correlates of unhealthy drinking in the IANG by evaluating SBIRT data. It is expected that depression, age, deployment status, and sex will be factors contributing to unhealthy drinking. Furthermore, interactions among the study variables are explored. This study is an initial exploratory investigation aimed at identifying factors associated with unhealthy drinking to inform health practitioners and addiction professionals in identifying NG personnel who may be in need of services.

2. Methods

2.1. Participants

The IANG took part in a SAMHSA awarded SBIRT project. Between October 2014 to and February 13, 2015, 2033 soldiers took part of the standard SBIRT admission process during their routine physical examinations and data were collected. The total IANG admissions represent all consecutive admissions during the window of observation. In case of repeated screenings, only the participant's first record remained in the analysis. Soldiers were primarily White (96.3%, $n = 1958$) males (86.1%, $n = 1750$). Black/African Americans (2.3%, $n = 47$) were infrequent, as were Latinos (3.1%, $n = 63$). Less than 1% reported some other race or ethnic group. The mean age was 28.4 years ($SD = 9.2$, range = 18 to 55). The majority were never deployed (58%, $n = 1179$) and many had been previously deployed (42.0%, $n = 854$), most often to Iraq or Afghanistan (39.4%, $n = 801$). Because these data represent de-identified pre-existing service data collected by IDPH, there was no informed consent and the University of Iowa Human Subjects Office Institutional Review Board exempted this study from review.

2.2. Measures

2.2.1. Outcome measure

For males, the alcohol-pre-screening question was "How many times in the past year have you had 5 or more drinks in a day?" For females, the question asked about 4 or more drinks. Clients who answered "1 or more times" to this question were considered positive for the screening. A positive screening signaled administration of the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001; Skinner, 1982). Unhealthy alcohol use was defined as a positive response to the pre-screening question and an AUDIT score of 8 or above. This cut off was adopted because in primary care facilities clients with AUDIT scores of 8 or above are referred to intervention or treatment (Babor et al., 2001). The AUDIT screening criteria for SBIRT IOWA scoring is: encouragement and education (0–7), brief intervention (8–15), brief treatment (16–19), referral to outside treatment (20+; SAMHSA, 2014). The AUDIT has demonstrated high overall sensitivity (92%) and specificity (93%) with international samples of patients in healthcare settings (Babor et al., 2001).

2.2.2. Depression

Soldiers filled out the Patient Health Questionnaire (PHQ-9) to assess depression symptoms (Kroenke, Spitzer, & Williams, 2001). These authors categorized levels of depression severity using PHQ-9 scores in the following way: none-minimal (scores of 1–4), mild (5–9), moderate (10–14), moderately severe (15–19), and severe (20–27). The PHQ-9 was developed for use with healthcare samples and upon initial validation demonstrated sensitivity (88%) and specificity (88%) for identifying major depression (Kroenke & Spitzer, 2002).

2.2.3. Deployment status

Deployment status consisted of any past lifetime deployment. None of the sample was currently deployed. Deployment was coded as Never Deployed and Previously Deployed. Previously Deployed included Iraq and Afghanistan, Persian Gulf, Vietnam and South East Asia, Korea, World War II, and Deployed but Not Listed.

2.2.4. Demographics

Sex was self-reported at the initial SBIRT pre-screening as male or female. The pre-screening was conducted at the initial physical examination. Age was also self-reported at pre-screening. For comparison and follow up tests, age was categorized in quartiles.

2.3. Statistical analyses

All data analyses were conducted using STATA 13.1 (StataCorp, College Station, TX) and SAS 9.4 (SAS Institute, Cary, NC). Chi-Square tests for difference and Mann-Whitney tests were used to compare the unhealthy versus healthy alcohol use groups. Logistic regression was used to predict unhealthy alcohol use. The full model included all predictors available that were indicated by previous literature (i.e., Depression, Deployment, Sex, and age). All second order interactions were also included to test for any non-additive effects. We reduced the full model based on optimal values of both AIC and BIC using automatic backward elimination. The model with the best (lowest) AIC and BIC signaled the final model. The choice of automatic backward elimination for selecting the best model was based in that there is no clear evidence in the literature indicating how these predictors should be prioritized for predicting unhealthy alcohol use. Due to missing data (PHQ-9 $n = 53$, Sex $n = 19$, 3.5%), the multivariate analysis used 1963 clients. Age and its interactions were mean-centered and treated as continuous for the logistic regressions. The Hosmer-Lemeshow Goodness-of-Fit Test was used to determine the appropriateness of the regression model. Follow-up logistic regressions predicting unhealthy alcohol use were used for class levels with significant interaction terms. Follow-up interaction tests categorized age in quartiles for interpretation. Odds ratios (OR) and risk differences (RD) provide measures of effect.

3. Results

Just over half (50.6%, $n = 1029$) of the soldiers responded positively on the pre-screen question about alcohol and took the AUDIT. The mean AUDIT score was 4.3 (SD = 2.4). Of those who were positive on the pre-screen, 7.3% ($n = 75$) met our criteria for unhealthy drinking, which was 3.7% of the total sample. According to the PHQ-9 scoring, 96.1% ($n = 1903$) had a depression severity of None, 2.5% ($n = 50$) Mild, 1% ($n = 19$) Moderate, and <1% ($n = 9$) Moderately Severe or Severe. In the present study, due to the low frequencies of the higher severity categories, depression severity was treated as a binary variable, none-minimal versus depressed (including mild, moderate, and moderately-severe or severe).

3.1. Bivariate analyses

Unhealthy drinking was more frequent in males (4.1%, $n = 72$) than females (1.1%, $n = 3$; $\chi^2 = 6.26$, $df = 1$, $p < 0.05$). In the Depressed group, 15.4% ($n = 12$) reported unhealthy drinking while in the None group, 2.9% ($n = 55$; $\chi^2 = 35.80$, $df = 1$, $p < 0.001$) reported unhealthy drinking. There was no evidence of an association between unhealthy drinking and deployment, 3.3% ($n = 39$) never deployed versus 4.2% ($n = 36$) previously deployed ($\chi^2 = 1.17$, $df = 1$, $p = 0.28$). In addition, there was no evidence for an association between unhealthy drinking and age (Mann-Whitney $z = 0.72$, $p = 0.47$). Table 1 shows the study variables number and percentage with age quartiles for descriptive purposes.

3.2. Multivariate analyses

The study variables were entered into a logistic regression to predict unhealthy alcohol use. The final model included depression status, deployment, sex, age, and the interaction between depression status and age as predictors. The overall multivariate model significantly predicted unhealthy drinking ($-2 \text{ Log Likelihood } \chi^2 = 41.41$, $df = 5$, $p < 0.001$). After adjusting for deployment and gender, age moderated the association of depressive status and unhealthy alcohol (Wald $\chi^2 = 7.16$, $df = 1$, $p = 0.007$; Table 2). In addition, after adjusting for the effects of age, depression, and gender, the odds of unhealthy alcohol use for previously deployed guardsmen were about twice the odds of never deployed guardsmen. Adjusted odds of unhealthy alcohol use for men were also

Table 1

Alcohol and depression screening for SBIRT IOWA National Guard and demographics by age quartile.

N = 2033	n	%
Depression screening (PHQ-9)		
Depressed	78	3.93
Not depressed	1903	96.06
Alcohol screening (AUDIT)		
Unhealthy use	75	3.69
Not unhealthy use	1958	96.31
Sex		
Male	1751	86.13
Female	282	13.87
Deployment status		
Previously deployed	853	41.96
Never deployed	1180	58.04
Age quartiles		
18–20	458	22.74
21–25	545	27.06
26–33	485	24.08
34–55	526	26.12
Depressed by age quartile		
18–20	18	0.92
21–25	19	0.97
26–33	16	0.82
34–55	24	1.22
Unhealthy drinking by age quartile		
18–20	14	0.70
21–25	26	1.29
26–33	18	0.89
34–55	16	0.79
Male by age quartile		
18–20	377	21.70
21–25	462	26.60
26–33	421	24.24
34–55	477	27.46
Female by age quartile		
18–20	81	29.24
21–25	83	29.96
26–33	64	23.10
34–55	49	17.69
Previously deployed by age quartile		
18–20	3	0.36
21–25	113	13.50
26–33	325	38.83
34–55	396	47.31
Never deployed by age quartile		
18–20	455	38.66
21–25	432	36.70
26–33	160	13.59
34–55	130	11.05

Note. PHQ-9 = Personal Health Questionnaire, AUDIT = Alcohol Use Disorders Identification Test, Categories may not add to total due to missing data. Percentages may not add to 100 due to rounding.

about 4 times than the odds for women. The Hosmer-Lemeshow Goodness-of-Fit Test suggested adequate fit ($\chi^2 = 12.63$, $df = 8$, $p = 0.12$).

To interpret the interaction of depressive status and age on unhealthy drinking, the full sample was grouped into quartiles of age.

Table 2

Logistic regression results predicting unhealthy drinking.

Variable	Odds ratio	95% CI	Estimated β	SE	Wald χ^2	p
Intercept			−3.32	0.79		
Depressed	0.38	0.04–3.90	−0.97	1.19	0.67	0.415
Previously deployed	2.16	1.14–4.08	0.77	0.33	5.62	0.018
Male	3.51	1.08–11.41	1.26	0.60	4.36	0.037
Age ¹	0.94	0.89–0.98	−0.06	0.02	7.43	0.006
Depressed × Age	1.10	1.02–1.18	0.10	0.04	7.16	0.007

¹ Age, in years, was centered at its mean for this analysis. The referent category for Depressed was Not Depressed, for Previously Deployed was Never Deployed, for Male was Female. CI = Confidence Interval. SE = Standard Error.

Fig. 1 shows the percentage of unhealthy drinking for depressed and non-depressed guardsmen by age quartile.

Follow-up logistic regression predicting unhealthy alcohol use for each age quartile group determined one significant difference between mean-centered age quartiles and depression predicting unhealthy drinking. The oldest group, ages 34–55, was more likely to demonstrate unhealthy drinking in the depressed group than the non-depressed group (RD = 22.79, 95%CI: 5.21–40.36, $p = 0.011$). The remaining age groups were non-significant: 18–20 years (RD = 3.22, 95%CI: –7.11–13.54), 21–25 years (RD = 5.64, 95%CI: –7.17–18.45), and 26–33 years (RD = 17.09, 95%CI: –3.03–37.22). Thus, for soldiers aged 33 or younger, the presence of depressive symptoms had no significant effect on unhealthy drinking. For the older soldiers, the depressive symptoms gain substantial predictive value as demonstrated by a larger (and significantly different from 0) RD than for the younger guardsmen.

4. Discussion

The present study sought to explore correlates of unhealthy drinking in the IANG by evaluating SBIRT data. It was expected that depression, age, deployment status, and sex would be predictive of unhealthy drinking. Perhaps more interestingly, the present study found a significant interaction between age and depression predicting problem drinking. This finding demonstrates the need for treatment providers to consider both age and depression as they act together. In bivariate analyses, being male and being depressed were associated with unhealthy drinking, while deployment and age demonstrated no association. However, the issue seems to be more multifaceted with deployment status predicting unhealthy drinking when considered in a multivariate model. Age moderated the association of depressive symptoms and unhealthy alcohol use in the NG. These findings contribute to the current understanding of NG personnel and the association age and depression have with drinking in this population. Furthermore, this study provides some of the first data available from the SBIRT program with NG personnel.

Important information from this study provided data in response to previous research in NG unhealthy drinking prevalence and correlates predictive of unhealthy drinking behavior. The present study found 50.6% of the guardsmen in the sample screened positive on the pre-screen question about alcohol. Comparing past-year unhealthy drinking between the NG (50.6%), the general population (14%; Dawson et al., 2005), and active-duty military personnel typical drinking occasion – moderate to heavy drinking (45%; Mattiko et al., 2011) – demonstrates potentially more unhealthy drinking in the NG. While the present study and Dawson et al. (2005) used the AUDIT family of measurements with

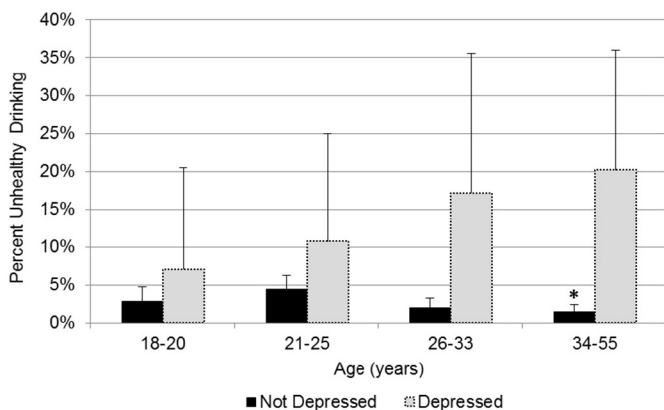
a cutoff of eight, the Mattiko et al. (2011) study used a heavy drinking measure. Further analyses are needed to compare differences between the NG, active-duty personnel, and the general population with comparable measurement instruments. These differences may be a factor of military substance misuse help-seeking stigma and views of heavy drinking as a rite of passage in the military (Gibbs, Rae Olmsted, Brown, & Clinton-Sherrod, 2011). Unfortunately, due to the lack of diagnostic information about substance use disorders in these datasets, neither this manuscript or that by Mattiko et al. (2011) provide a link between heavy drinking and diagnosed substance use disorders. If 3.7% of the IANG with unhealthy drinking would in fact be diagnosed with a substance use disorder, this would more than double the 1.7% reported by Seal et al. (2009). Again, this is still unknown and future studies could improve upon this understanding by accounting for diagnosed substance use disorders in the NG.

Additionally, this research is supportive of deployment (Ferrier-Auerbach et al., 2009; Jacobson et al., 2008) as a correlate of unhealthy drinking. In the IANG sample, there was no evidence that deployment status was associated with unhealthy drinking in the univariate analysis. However, in the multivariate analysis deployment was significant. Ferrier-Auerbach et al. (2009) sampled NG personnel scheduled for deployment and those with PTSD. In contrast, the present findings analyzed previous deployment experiences regardless of PTSD diagnosis. The inclusion of PTSD diagnoses may explain this difference but further research is needed to determine this relationship. The present study found that when sex, age, and depression were added into the model, those who were previously deployed were more than twice as likely to demonstrate unhealthy drinking. This may be due to a lack of prevention and treatment programs made available to returning guardsmen. In addition, coping with the transition back to civilian life may be difficult and guardsmen may not have a repertoire of healthy coping strategies (Jacobson et al., 2008). Health professionals may help address this issue with targeted educational groups for civilian reintegration, which focus on healthy coping strategies.

The greatest contribution from this research was the finding that age appears to moderate the association between depressive status and unhealthy drinking in the NG. These findings add to the existing understanding of factors contributing to unhealthy drinking suggesting the presence of depression and problem drinking behaviors depends on age of the guardsmen. This age and depression interaction may be an important diagnostic feature to consider for unhealthy drinking in the NG. While SBIRT serves primarily as a screening program, results indicate that younger guardsmen's depression may not be related to their drinking to the same extent as it is for older guardsmen. This information can be helpful in assessing client motivation, and in referring to fitting outside treatments, especially to programs specializing in dual-diagnosis.

The present findings also support previous research in the heavy and binge drinking correlates of age (Ferrier-Auerbach et al., 2009; Vander Weg et al., 2006). Findings of Australian Defense force members comparing AUDIT cutoffs at either 16+ or 20+ demonstrated binge drinking was only significantly more likely for the youngest age quartile at the 16+ cutoff. At the 20+ cutoff all groups showed a difference in binge drinking (Waller et al., 2015). Findings at the different cutoffs may mean more severe drinking problems are not associated with age. Mattiko et al. (2011) reported that military personnel demonstrated greater heavy drinking than civilians for those aged 18–25 and 26–35 and lower rates for those aged 46–64. However, they used an AUDIT cutoff of 8+. Mattiko et al. (2011) demonstrated age may be important to consider for heavy drinking using the same AUDIT cutoff as the present study but lower heavy drinking in the older guardsmen. Mattiko and colleagues' finding in older guardsmen is in contrast to the present study, however, neither the Waller et al. (2015) nor the Mattiko et al. (2011) studies accounted for depressive status using the PHQ-9.

This research does have limitations of note. The first is that these findings represent service data rather than research data. Madras et al.



Note: Error bars represent symmetric 95% confidence intervals
* $p < 0.05$.

Fig. 1. Percent unhealthy drinking for depressed and not depressed guardsmen by age quartiles. Note: Error bars represent symmetric 95% confidence intervals * $p < 0.05$.

(2009) suggest limitations related to service data of this nature, including missing data and implementation variation. However, they also point to several strengths such as the realistic reflection of clinical practice. Second, these data represent self-reports subject to response bias as patients reporting alcohol use may feel they are under the scrutiny of the NG. In fact, the information patients report to SBIRT staff is confidential, as the staff is not formed by NG employees, but rather by civilian treatment providers. Third, the present study uses the AUDIT as a measure of past-year drinking behaviors. The majority of research with active-duty military personnel reports past-30-day alcohol behaviors in prevalence estimates. Past-year and past-30-day use are not comparable measures, but both give an indication of need. This study was interested in service data where the past-year measures were already in use. However, further research can now use the present past-year findings to compare and contrast results. Finally, conclusions are limited by the small sample size for some of the comparisons. For example, only three women were observed in the female/unhealthy drinking category. The entire set of unhealthy drinkers only included 75 participants. For these particular comparisons, a replication of our findings with a larger sample size is warranted.

This study aimed at uncovering factors associated with unhealthy drinking to inform health practitioners in identifying NG personnel who may be in need of services. The SBIRT IOWA patients' percentage of unhealthy drinking was greater with each increasing age quartile. In addition, the percentage with depression was greater with each increasing age quartile as well. This may signify a greater need to treat depression along with unhealthy drinking, as guardsmen grow older. While SBIRT is a program aimed at universal screening, not accounting for individualized patient needs such as the age/depression interaction may fail to address the problem of unhealthy drinking. Missing individual client needs may result in increased future treatment episodes costing additional time and money for both the patient and the healthcare services. These findings suggest that assessments beyond the screening need to account for the interplay between depression and age when identifying those with potential unhealthy drinking. Furthermore, health professionals may wish to take into consideration the pronounced odds of unhealthy drinking with increasing age for depressed patients with military experience as part of the motivational interviewing process and potential referrals to programs catering to dual-diagnosis.

Role of funding sources

This research was funded by the Iowa Department of Public Health (Contract # 588-6-YM50).

Contributors

Mr. Sahker and Dr. Arndt designed the study and wrote the protocol. Mr. Sahker conducted literature searches and provided summaries of previous research studies. Dr. Arndt and Dr. Acion conducted the statistical analysis. Mr. Sahker, Dr. Arndt and Dr. Acion wrote the first draft of the manuscript and Mr. Sahker edited and contributed to the writing of subsequent drafts. All authors contributed to this work, and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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