Prevalence and Severity of Alcohol and Cannabis Use Across the Urban-Rural Continuum in the Michigan National Guard

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Running Head: Rural and Urban Alcohol and Cannabis Use

Abstract

Purpose: The National Guard provides critical support both domestically and abroad with soldiers dispersed throughout America and spanning the urban-rural continuum. To determine if location-specific interventions may be needed, we compared the prevalence and severity of cannabis and alcohol use among National Guard members across localities.

Methods: Michigan National Guard members were enrolled (N=2746) during drill weekends as part of a larger randomized behavioral trial. Cannabis (ASSIST; prevalence=5%) and alcohol use (AUDIT; prevalence=82%) were compared using hurdle regression models across locality status after adjusting for covariates.

Findings: Prevalence of cannabis and alcohol use was predicted by locality (AOR=0.913, 95% CI: 0.838-0.986, P = .029; AOR=0.963, 95% CI: 0.929-0.998, P = .038, respectively), with more use in urban localities. Neither severity of cannabis nor alcohol use was predicted by locality status.

Conclusions: Prevalence of cannabis and alcohol use in the National Guard is differentially elevated across localities with higher prevalence in more central, densely populated areas. Findings may inform future work considering accessibility and utilization of prevention and treatment services for Guard members across the urban-rural continuum.

Key Words: alcohol, cannabis, National Guard, rural, urban

Reserve Component members of the US Armed Forces, especially the Army National Guard, have played an increasingly important role in recent wars. Approximately one-third of service members deployed overseas have come from the National Guard and Reserves,[1,2] and future war planning anticipates heavy use of Reserve Components. An increased reliance on the National Guard requires that their resilience be maintained at a level comparable to active duty forces. This is challenging since they must cope with both their civilian and part-time military roles. Compared to Active Component service members, National Guard soldiers experience a disproportionate burden of mental health and substance use problems, especially following deployment.[3,4]

Previous national surveys have shown higher rates of alcohol misuse among military personnel than their civilian counterparts.[5,6] Overall, estimates of alcohol misuse among Reserve Component service members are slightly lower than Active Component members (16.7% and 20.0%, respectively); however, estimated rates in the Army National Guard (21.1%) are similar to those of Active Component service members.[7-10] Prior reports on the use and misuse of cannabis among service members is limited, and rates may be underestimated due to reluctance to admit use which is prohibited and would affect military status and advancement. The most recent Department of Defense (DoD) Survey of Health Related Behaviors reported that 0.6% of active duty respondents used cannabis in the past year, compared to an estimated 8.7% of the civilian adult population; however, the survey had very low response rates.[6]

Reserve Component members face greater challenges to receiving mental health services, including services for substance use. In contrast to full-time soldiers who reside on base at military stations, National Guard members live throughout their home states, dispersed across the urban-rural continuum. Many National Guard soldiers live in remote areas with health care provider shortages. Prior work points to the decentralized nature of the

National Guard as increasing their burden to receive services, often leading these soldiers to seek out civilian providers or travel long distances to military or veterans' health care facilities.[11,12] However, the impact of the dispersed residence of National Guard soldiers on alcohol and cannabis use is largely unknown.

To the best of our knowledge, no studies report the dispersion of alcohol and cannabis use across urban-rural localities among National Guard members. Assessing the distribution of alcohol and cannabis use among these soldiers may impact policy to reduce barriers and improve access to services. In order to better characterize, meet treatment needs, and provide support to National Guard service members, we consider alcohol and cannabis use in Michigan National Guard members including the intersection with mental health symptoms (depression, anxiety, and PTSD), service (length of service, deployments, rank), and demographic characteristics across localities.

Methods

Michigan National Guard members were enrolled (N=2746) during drill weekends as part of a larger trial (ClinicalTrials.gov ID: NCT02181283), which was approved by the University of Michigan IRBMED.

Procedure

Forty-one National Guard units in Michigan were randomly selected from among all units to assure that the sample broadly represented the specialties and geographical locations of all Guard members. Soldiers in attendance at drill weekends from April 2015 to June 2017 were offered the opportunity to participate in an ongoing randomized controlled trial (RCT). Over 26% of the total Michigan Guard membership completed the initial assessment. Soldiers were

approached in person by research assistants, those interested in participating provided written informed consent, and they completed a self-administered baseline health survey. Participants were compensated $20 for completion of the assessment measures.

Measures

The primary independent variable of interest, locality status, was based on the home ZIP Code of the National Guard member at the time of participation. Locality status was determined by linking the participant ZIP Code to its Rural-Urban Commuting Area (RUCA) zone[13,14] based on the 2010 decennial census and the 2006-10 American Community Survey. Using ZIP Codes to determine rural-urban status provides a finer geographic unit than other county-based categorization systems such as the Office of Management and Budget's Metro, Non-Metro taxonomy. For the purposes of the current study, RUCA codes were used to define locality status of National Guard service members across the urban-rural continuum, which ranges from 1 to 10.3, where higher values indicate more rural residence. While this variable was used as a continuous variable, values can be interpreted as fitting into the following categories: (1) urban (RUCA = 1-3, area population size ≥50,000), (2) rural (RUCA = 4-6, area population size 10,000-49,999), and (3) extremely rural (RUCA = 7-10.3, area population size ≤9,999).

The primary outcome measures of alcohol and cannabis use were assessed using the Alcohol Use Disorder Identification Test (AUDIT) and Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST), respectively. The AUDIT, used to assess presence and severity of alcohol use, is a 10-item questionnaire that includes domains on alcohol consumption, drinking behaviors, and alcohol-related problems. Total scores range from 0 to 40 where higher scores indicate greater alcohol use severity.[15] The ASSIST, used to assess cannabis use and severity of use, is an 8-item questionnaire that provides a risk score ranging

from 0 to 44 where higher scores indicate greater severity.[16] Outcome measures were missing in 4 cases for the AUDIT and 6 cases for the ASSIST. These individuals were excluded from the analyses.

Sample characteristics variables were collected and considered as covariates in the analysis. These included demographic characteristics (age, sex, income, and employment status), mental health questionnaires (Generalized Anxiety Disorder 7 (GAD-7)),[17] the Patient Health Questionnaire (PHQ-9),[18] the PTSD Checklist for DSM-5 (PCL-5),[19] and service history characteristics (years of service in the National Guard, number of prior out-of-country deployments, and current rank in the National Guard).

Statistical Analysis

The 10 demographic, mental health, and National Guard characteristics reported in Table 1 were included in an exhaustive (2^10 = 1,024 considered models) Bayesian Information Criterion (BIC) model selection routine for alcohol and cannabis outcomes separately using the *bestglm* R package.[20] The BIC model selection considers all possible combinations of variables with a penalty for more parameters in the model and selects the model with the lowest BIC. The set of predictors identified for alcohol and cannabis outcomes were modeled alongside the primary variable of interest, locality status. Both the main effects of locality status and selected covariates as well as 2-way interactions between locality and covariates were assessed. Interaction terms that were not significant were dropped from the models. Prevalence and severity of alcohol and cannabis use were assessed separately using a 2-part hurdle model. The hurdle model separately specifies one process for zero counts and a separate process for positive values. As applied to the current dataset, the hurdle model estimated prevalence of alcohol and cannabis use using a logistic regression and separately

estimated severity of use among those who reported alcohol or cannabis use using a negative binomial regression.

Results

Among those approached, 86.0% enrolled in the study and completed the baseline survey. A common reason for refusal was being too busy during the drill weekend. Sample characteristics are shown in Table 1 including demographics, mental health, and service characteristics. Overall, alcohol use (n=2257, 82.3%) was more common than cannabis use (n=137, 5.0%). In the current sample, 16.5% of the entire sample screened positive for risky drinking (AUDIT score ≥8)[15] and 3.8% had problematic cannabis use (ASSIST score >3).[16] For alcohol use (AUDIT), the BIC routine identified age, gender, depression, and PTSD symptoms; the top model for cannabis use (ASSIST) identified age and depression symptoms.

No significant interactions were detected in any of the models so main effects are reported below and in Table 2. Prevalence of alcohol use was significantly predicted by locality status (adjusted odds ratio [AOR]=0.963, 95% confidence interval [CI]: 0.929-0.998, $P = .038$), age (AOR=1.023, CI: 1.010-1.036, $P < .001$), and depression symptoms (AOR=1.092, CI: 1.059-1.129, $P < .001$).

In the alcohol severity model, age (risk ratio [RR]=0.990, CI: 0.986-0.994, $P < .001$), sex (reference female, RR=0.821, CI: 0.750-0.899, $P < .001$), depression symptoms (RR=1.059, CI: 1.052-1.067, $P < .001$), and PTSD symptoms (RR=1.006, CI: 1.004-1.009, $P < .001$) each significantly predicted alcohol use severity. No main effect of locality status on alcohol use severity was detected (RR=0.996, CI: 0.984-1.007, $P = .473$, *ns*).

Prevalence of cannabis use was predicted by locality status (AOR=0.913, CI: 0.838-0.986, $P = .029$), age (AOR=0.933, CI: 0.905-0.960, $P < .001$), and depression symptoms (AOR=1.121, CI: 1.090-1.153, $P < .001$). The only significant predictor of cannabis use severity was increasing depression symptoms (RR=1.053, CI: 1.034-1.073, $P < .001$).

Discussion

The present study compared the prevalence and severity of alcohol and cannabis use among Michigan National Guard members across urban and rural geographic localities. Those living in urban areas were the most likely to drink, with 82.9% of urban and 78.4% of extremely rural Guard members reporting alcohol use. Locality was not significantly related to increasing alcohol misuse. These findings are consistent with prior alcohol-specific research in military veterans reporting the highest prevalence of alcohol use in urban veterans and no differences in more severe, unhealthy use across localities.[21] More depression symptoms and older age were associated with alcohol use and severity of use; in addition, male sex and more severe symptoms of PTSD were also associated with increased severity of alcohol use. These findings are consistent with prior reports among National Guard members[22–25] showing worsened trajectory of use when co-occurring with mental health symptoms.

The reported rate of cannabis use among the Guard (5.0%) was greater in urban than rural individuals. The majority of National Guard members that used cannabis reported use patterns indicative of misuse (76.0% of those that reported any cannabis use). In addition, increased depression symptoms predicted severity of cannabis use. The reported rate of cannabis use for National Guard members was notably higher than that reported for active duty members (0.6%) in the most recent DoD report[2] and is lower than, but much closer to, the rate for civilian adults (8.7%). This finding highlights the reality that Reserve Component

members face the challenges of civilian life while trying to concurrently maintain their resilience for military service. To support psychological resilience among Reserve Component members, empirically supported services and programs may need to be implemented or extended,[5,26] especially to help overcome hurdles of simultaneously navigating both civilian and military life. The significant relationship between depression and cannabis misuse is the first we have noted in a large military population and underscores the importance of having a full continuum of mental health and substance use resources available for all National Guard members.

Limitations

Limitations of the current study include the potential for underreporting of alcohol and cannabis use due to the use of self-report measures, possible concerns about limits to confidentiality, and/or social desirability bias. With regard to cannabis findings, Michigan passed legislation legalizing the use of cannabis for medical purposes in 2008 and for recreational purposes in 2018, after the completion of the current study. The effects of these laws on the use of cannabis among National Guard members is unknown.

Conclusion

In conclusion, National Guard service members in more urban areas drink alcohol and use cannabis at higher rates than their rural counterparts; however, severity of use appears similar across localities. For those service members that live in more rural areas that are distal from many services, electronic health (E-health) interventions to reduce the hazardous use of alcohol and other substances may be of particular value. In addition to where National Guard members reside, mental health symptoms play a critical role in rates and severity of alcohol and cannabis use. These findings point to Reserve Component members facing many

significant challenges in maintaining their resilience that warrant prioritizing availability of needed mental health and substance use services. Regardless of Reserve Component members' geographic locality, services should be available that are consistent with current guidelines for identification and engagement of those in need.[27]

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Table 1. Sample Characteristics

	Alcohol		Cannabis	
	no (n=485)	yes (n=2257)	no (n=2603)	yes (n=137)
Locality Status (%)*				
Urban	68.5	71.5	70.7	75.9
Rural	14.9	15.5	15.3	16.8
Extremely Rural	16.7	13.0	14.0	7.3
Demographics				
Age (avg.[sd])	**27.6 (9.3)**	**29.3 (8.3)**	**29.1 (8.6)**	**26.0 (6.5)**
Sex (% male)	83.7	86.8	86.5	81.3
Income (%)				
$25k of less	**28.0**	**25.5**	**25.5**	**40.2**
$25,001-50k	**26.6**	**30.4**	**29.6**	**30.7**
$50,001-75k	**16.1**	**21.1**	**20.4**	**15.3**
$75,001-100k	**8.5**	**9.9**	**10.0**	**3.7**
>100k	**6.4**	**6.9**	**7.0**	**2.2**
Don't know	**11.6**	**4.9**	**6.0**	**7.3**
Refused	**2.9**	**1.47**	**1.7**	**0.7**
Employment (%)				
Full time	**63.5**	**72.7**	**71.8**	**56.7**
Part time	**17.9**	**13.9**	**14.4**	**19.0**
Unemployed	**7.8**	**5.6**	**5.7**	**13.1**
Student	**8.0**	**6.2**	**6.4**	**8.0**
Other	**2.3**	**1.4**	**1.5**	**2.2**
Missing	**0.4**	**0.3**	**0.3**	**0.7**
Mental Health Questionnaires (avg. [sd])				

Depression (PHQ-9)	**2.2 (4.0)**	**3.7 (4.8)**	**3.3 (4.5)**	**6.6 (6.1)**
Anxiety (GAD-7)	**2.7 (4.1)**	**4.3 (4.8)**	**3.9 (4.6)**	**7.1 (5.5)**
PTSD (PCL-5)	**2.5 (9.4)**	**5.1 (12.7)**	**4.4 (11.7)**	**9.5 (18.2)**
Service Characteristics				
Years in Guard (%)				
0-4	**61.4**	**48.0**	**49.6**	**65.0**
5-10	**24.7**	**33.6**	**32.3**	**27.7**
11-20	**10.3**	**15.6**	**15.1**	**5.8**
21+	**3.5**	**2.8**	**3.0**	**1.5**
Deployments (%)				
0	**67.8**	**50.4**	53.4	55.5
1	**18.1**	**25.1**	23.7	27.7
2	**7.6**	**13.6**	12.8	7.3
3	**3.9**	**7.2**	6.5	8.0
4+	**2.5**	**3.7**	3.6	1.5
Rank (%)				
E1-E4	**66.6**	**53.6**	**54.7**	**78.1**
E5-E6	**24.1**	**34.3**	**33.2**	**19.0**
E7-E9	**5.0**	**5.7**	**5.8**	**0.7**
WO1-WO5	**0.2**	**0.7**	**0.6**	**0.7**
O1-O3	**4.1**	**5.3**	**5.3**	**1.5**

Bolded categories significantly differed ($P < .05$) between those that reported alcohol (yes/no) or cannabis (yes/no) use. * Reported as percent of those that reported use or non-use of alcohol or cannabis by locality status.

Table 2: Hurdle Models of Alcohol and Cannabis Use

	Alcohol	
	Prevalence	**Severity**
Model	**Adjusted Odds Ratio (95% CI)**	**Risk Ratio (95% CI)**
Locality	**0.96 (0.93-1.00)**	1.00 (0.98-1.01)
Age	**1.02 (1.01-1.04)**	**0.99 (0.99-0.99)**
Sex (female)	0.76 (0.58-1.00)	**0.82 (0.75-0.90)**
PHQ-9	**1.09 (1.06-1.13)**	**1.06 (1.05-1.07)**
PCL-5	1.01 (0.99-1.02)	**1.01 (1.00-1.01)**
	Cannabis	
Locality	**0.91 (0.84-0.99)**	1.01 (0.95-1.07)
Age	**0.93 (0.91-0.96)**	0.99 (0.97-1.01)
PHQ-9	**1.12 (1.09-1.15)**	**1.05 (1.03-1.07)**

Significant values ($P < .05$) are indicated by bolded text.