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Title

The Association of Depression, Rurality, & Marital Status with Alcohol Use in a Rural Northeastern State

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Abstract:

Objective: To determine whether social support and rurality impact the association between heavy alcohol use and depression in Vermont adults.

Methods: A cross-sectional design was used to investigate the association of heavy alcohol use and depression using the 2021-2022 Vermont Behavioral Risk Factor Surveillance System, (n=15,391). Analyses used weighted binomial logistic regression stratified by marital and metropolitan status.

Results: Participants with heavy alcohol consumption were more likely to have depression (OR=1.11, 95% CI 1.1-1.41, $p < 0.001$). This was consistent for single parents without spousal social support (OR=1.83, 95% CI 0.78-1.88 $p < 0.001$). Heavy alcohol consumption was associated with depression in metropolitan counties but not in non-metropolitan counties (OR=1.42, 95% CI 1.38-1.47 $p < 0.001$).

Conclusions: There is an association between heavy alcohol use and depression. Marital status and rurality do not impact the association between heavy alcohol use and depression among our population. Higher income was protective against depression across all demographics.

Policy Implications: Health policies should adapt to diverse socioeconomic backgrounds and settings, considering the impact of social support and rurality on mental health outcomes, especially regarding depression and alcohol use.

INTRODUCTION

In the United States in 2021, approximately 51 million adults ages 18 and older reported having either a serious mental illness (SMI) or substance use disorder (SUD) in the last year.¹ 6.4 million adults reported co-occurring SMI and SUD.¹ Young adults, ages 18 to 25, experienced disproportionately higher rates of SMI or SUD compared to all other age groups.¹ In Vermont, the numbers reported for both alcohol consumption and depression were higher compared to national rates.^{1,2}

Over six in ten Vermont adults consumed alcohol in the past month, while one in ten reported drinking heavily in the past month.² Both alcohol consumption statistics were 9% and 3% higher than the reported national average. One quarter of Vermont adults reported ever being told by a medical professional that they had a depressive disorder, which is 6% higher than U.S. adults.² Although men are more likely to report using alcohol, women are more likely to report drinking heavily and having depression.²

Many cross-sectional studies and population-based surveys provide useful data on the prevalence of co-occurring alcohol use disorder and depressive disorders.^{3,4} Many of the studies examine socioeconomic factors, such as income, employment, and education.

Our research aims to evaluate the association between heavy alcohol consumption and depression among Vermont adults and the impact social support and rurality have on this association. This research builds on the current literature affirming the link between alcohol consumption and depression. Vermont counties provide an excellent representation of U.S. northeastern rural communities, and the research here can inform programming that could be replicated across the northeastern region of the country.

METHODS

Study Design & Data Sources

This research utilized a cross-sectional design to investigate the association between heavy alcohol use and depression among Vermont adults and the roles of social support and rurality in this relationship. Data were sourced from the 2021-2022 Vermont Behavioral Risk Factor Surveillance System (BRFSS), an annual telephone survey conducted with adult Vermont residents.¹⁰

Subjects

The BRFSS employs a random selection process, generating a list of phone numbers for outreach.¹⁰ Eligibility criteria includes age and residency in Vermont for at least thirty days annually.¹⁰

Sample Size

The research included data from the 2021 (N=6,580) and 2022 (N=8,811) survey years, yielding a total sample of 15,391 respondents.

Variables

The exposure variable, heavy alcohol use, was categorized by sex, with fourteen or more drinks per week for males and seven or more drinks per week for females. These variables were dichotomized, with “No” indicating the absence of the respective behavior and “Yes” its presence.

The outcome variable, depression, was ascertained through variables assessing self-reported diagnoses. Participants were asked if they have ever been told they had a depressive disorder, including depression, major depression, dysthymia, or minor depression.

Covariates included in our analysis were income, birth sex, race, metropolitan status, children in household, and marital status. Income was categorized into quartiles: <\$25,000,

\$25,000 to \$49,999, \$50,000 to \$74,999, and \geq \$75,000. Birth sex was a binary variable from the BRFSS question: What was your sex at birth? Was it male or female? Race was categorized into White, non-Hispanic or BIPOC (Black Indigenous People of Color). Metropolitan status was binary, with counties classified as metropolitan or nonmetropolitan by BRFSS. The number of children in the household was categorized into 0, 1, and 2+. Marital status was categorized as married or a member of an unmarried couple and not married.

Statistical Analysis

A weighted unadjusted binomial logistic regression analysis was conducted to explore the association between heavy alcohol use and depression, considering birth sex, race, income, and number of children in the household. Further binomial logistic regression analyses were stratified to explore the effects of social support, using marital status as a proxy, and rurality on the outcome of interest. All analyses were weighted using a VT BRFSS provided variable.

Analyses used SPSS Version 29 with $\alpha = 0.05$ for all tests.

RESULTS

TABLE 1 – Descriptive Statistics of Study Population Depressive Disorder Across Models Stratified by Marital Status and Metropolitan Status

Chi-Squared Test of Independence

	Total No. (%)	Depressive Disorder No. (%)	P value*	Social Support		P value*	Rurality		P value*
				Model I ¹ Married/Member of an Unmarried Couple	Model II ² Unmarried		Model III ³ Metropolitan County	Model IV ⁴ Non-Metropolitan County	
Heavy Alcohol Consumption	8.90%	27.0%	0.004*	22.4%	33.7%	0.383	29.2%	26.1%	0.568
Sex assigned at birth			<0.001*			<0.001*			0.131
Male	46.8%	34.9%		14.8%	22.9%		16.7%	18.1%	
Female	53.2%	65.1%		24.6%	35.5%		28.8%	29.0%	
Race			0.440			<0.001*			0.193
White non-Hispanic	93.1%	23.7%		19.8%	30.2%		23.0%	24.0%	
BIPOC	6.9%	24.9%		23.2%	29.6%		25.2%	24.8%	
Annual income (household)			<0.001*			<0.001*			0.316
<\$25,000	19.8%	40.4%		36.8%	41.3%		40.2%	40.5%	
\$25,000-\$49,999	26.0%	27.2%		26.1%	28.6%		26.4%	28.0%	
\$50,000-\$74,999	17.9%	23.3%		21.1%	24.4%		21.7%	24.0%	
\$75,000+	36.3%	19.3%		18.1%	30.7%		18.2%	24.8%	
Children in the household			0.001*			<0.001*			<0.001*
0 children	74.3%	23.0%		18.9%	28.5%		28.5%	23.1%	
1 child	11.6%	27.0%		23.6%	35.0%		35.0%	26.5%	
2 or more children	13.8%	25.5%		21.5%	41.6%		41.6%	26.8%	

Number of observations missing data on the following variables: income (n = 2,225); race (n = 291); marital status (n = 100); number of children in household (n = 55).

*p-value significant (p < 0.05)

TABLE 2 – Associations Between Heavy Alcohol Consumption and Depressive Disorder Across Models Stratified by Marital Status and Metropolitan Status

<i>Binomial Logistic Regression Analysis</i>					
		Social Support		Rurality	
	OR (95% CI)	Model I Married/Member of an Unmarried Couple	Model II Unmarried	Model III Metropolitan County	Model IV Non-Metropolitan County
Heavy alcohol consumption					
No	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*
Yes	1.109 [1.089, 1.130]*	1.113 [1.086, 1.141]*	1.058 [1.029, 1.088]*	1.421 [1.375, 1.469]*	1.008 [0.985, 1.030]
Sex assigned at birth					
Male	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*
Female	1.769 [.750, 1.788]*	1.836 [1.810, 1.863]*	1.634 [1.607, 1.661]*	2.084 [2.041, 2.127]*	1.659 [1.638, 1.680]*
Race					
White non-Hispanic	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*
BIPOC	1.177 [1.153, 1.201]*	1.127 [1.094, 1.161]	1.251 [1.215, 1.289]	1.176 [1.130, 1.224]	1.179 [1.151, 1.208]
Annual income (household)					
<\$25,000	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*
\$25,000-\$49,999	0.626 [0.615, 0.637]*	0.635 [0.611, 0.660]*	0.600 [0.588, 0.612]*	0.629 [0.609, 0.649]*	0.626 [0.613, 0.640]*
\$50,000-\$74,999	0.504 [0.494, 0.514]*	0.449 [0.432, 0.467]*	0.545 [0.531, 0.558]*	0.535 [0.516, 0.55]*	0.494 [0.482, 0.505]*
≥\$75,000	0.428 [0.420, 0.436]*	0.388 [0.374, 0.402]*	0.481 [0.470, 0.493]*	0.471 [0.455, 0.487]*	0.414 [0.406, 0.423]*
Children in the household					
0 children	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*	1 (Ref)*
1 child	1.330 [1.307, 1.354]*	1.251 [1.224, 1.279]*	1.494 [1.450, 1.540]*	1.461 [1.461, 1.511]*	1.285 [1.259, 1.312]*
2 or more children	1.494 [1.471, 1.570]*	1.395 [1.369, 1.421]*	1.829 [1.776, 1.882]*	1.254 [1.213, 1.296]*	1.574 [1.547, 1.603]*

Note. OR = odds ratio, CI = confidence interval. 1(Ref) = reference category. Number of observations missing data on the following variables: income (n = 2,225); race (n = 291); marital status (n = 100); number of children in household (n = 55).
*p-value = <.001

The analytic sample included 13,503 of the initial 15,391 respondents. Cases missing data on heavy alcohol consumption and depression were excluded (n=1,888). 53.2% of participants were assigned female at birth (Table 1). Participants mostly identified as white non-Hispanic at 91.4%. 61.5% of participants earned less than \$75k annually, and the majority lived in a non-metropolitan county as a member of a married or unmarried couple with no children. Unmarried participants had the highest prevalence of co-occurring heavy alcohol consumption and depression (33.7%), while married participants had the lowest prevalence of co-occurring heavy alcohol consumption and depression (22.4%).

Binomial logistic regression

A weighted unadjusted binomial logistic regression analysis was conducted to measure the effects of social support variables (Table 2). The Nagelkerke R Square coefficient reflected that 7% of the variability in heavy alcohol consumption can be attributed to depression. Marital status and metropolitan status were confirmed as effect modifiers through stratification of both variables with significant interaction terms ($p < 0.001$).

Further binomial logistic regression analyses were conducted stratified by these variables. Income was a protective factor across all models, with greater protection against depression as annual household income increased. BIPOC Vermonters were more likely to experience depression than white, non-Hispanic Vermonters (OR=1.177, 95% CI 1.153-1.201, $p < 0.001$), this was consistent across all models.

Unmarried participants had higher likelihoods of depression compared to married participants if they made over \$50k annually (OR=0.545, 95% CI 0.531-0.558, $p < 0.001$). Unmarried participants with 1 child had 1.494 times higher odds of depression, compared to

participants without children (OR=1.494, 95% CI 1.450-1.540, $p<0.001$) and 1.829 times the odds with 2 or more children (OR=1.829, 95% CI 1.776-1.882, $p<0.001$).

Metropolitan participants had higher odds of heavy alcohol consumption (OR=1.421, 95% CI 1.375-1.469, $p<0.001$) compared to nonmetropolitan participants (OR=1.008, 95% CI 0.985-1.030, $p<0.001$). Metropolitan participants with an annual household income of \geq \$75,000 had higher odds of depression (OR=0.471, 95% CI 0.455-0.487, $p<0.001$) compared to nonmetropolitan participants with the same income (OR=0.414, 95% CI 0.406-0.423, $p<0.001$). Metropolitan females had higher odds of depression (OR=2.084, 95% CI 2.041-2.127, $p<0.001$) than nonmetropolitan females (OR = 1.659, 95% CI 1.638-1.680, $p<0.001$).

DISCUSSION

Our research confirms that heavy alcohol use and depression are correlated in Vermont adults but does not highlight social support or rurality as risk factors. These findings stress the need for customized therapies and additional investigation of sociodemographic variables in mental health studies. Stratified analyses are warranted as the interaction terms validate the role of marital status and metropolitan status as effect modifiers.^{11,12}

Strengths of this study include a large sample size and an examination of social support factors. The discovery of effect modifiers improves the applicability of our results. Nonetheless, the cross-sectional design restricts the ability to draw conclusions about causality. Relying on self-reported data and decreasing survey participation may lead to response bias. While the BRFSS offers a valuable dataset, it lacks clinically determined diagnoses for depressive disorders, potentially impacting the validity and reliability of the results.

There are ramifications for clinical practice and research from our work. The finding that income is a protective factor raises the possibility that socioeconomic actions could lower the

incidence of depression. Our study supplements existing literature and provides insights for tailored public health strategies, highlighting vulnerabilities among Vermont adults. These findings emphasize the importance of addressing community needs through research-driven policies and innovative solutions for a healthier society.

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