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The role of food insecurity with hunger and physical activity level on binge drinking among Vermont high school students

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2 Abstract

3 **Objective:** To determine the association of hunger, physical activity, Black Indigenous People Of
4 Color (BIPOC) status , and BMI percentile on binge drinking among Vermont high schoolers.

5 **Methods:** A cross-sectional study was conducted on Vermont high school students aged
6 between 12 to 18 years (n=18,540) using data obtained from the 2019 Youth Risk Behavior
7 Survey of the Vermont Department of Health. Multiple logistic regression models were utilized
8 to investigate the correlation between binge drinking status and hunger status, physically active
9 status, BIPOC status, and Body Mass Index percentile.

10 **Results:** Binge drinkers had significantly higher levels of hunger (OR = 1.96; 95% CI = 1.69, 2.30),
11 physical activity (OR = 1.19; 95% CI = 1.09, 1.30), and lower levels of BIPOC status (OR = 0.81;
12 95% CI = 0.71, 0.93) compared to their non-binge drinking counterparts.

13 **Conclusions:** This study sheds light on the growing need of heightened awareness of risk factors
14 for binge drinking among high schoolers, particularly the relationship between binge drinking,
15 physical activity, and food insecurity with hunger.

16 **Keywords:** Binge drinking, food insecurity, physical activity, high schoolers

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29 **Introduction**

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31 Regular physical activity (PA) is one of the best proven preventive methods to control body
32 weight and the plethora of chronic diseases¹. A recent Centers for Disease Control and Prevention
33 (CDC) analysis shows that 15% of adults in every American state are physically inactive². Excessive
34 alcohol consumption or binge drinking can contribute to weight gain and obesity, which in turn
35 can lead to physical inactivity³. Binge drinking and physical inactivity are significant public health
36 concerns and have been well-documented in a number of studies⁴. Binge drinking is most
37 common among young adults aged 18-34 years and is more common among men than women⁴.
38 Additionally, food insecurity (FI) with hunger is a barrier to regular physical activity in several
39 ways. When individuals experience hunger with FI, they may be seen as physiologically and
40 psychologically less energetic, making it difficult to engage in regular PA and putting those
41 individuals at increased risk for poor health outcomes⁵.

42

43 The Vermont Youth Risk Behavior Survey (YRBS) reported that fewer students were physically
44 active for at least 60 minutes every day during the previous week⁶. Currently, there is no available
45 data on the extent to which high school students in Vermont are physically more active or less
46 active as a result of binge drinking and food insecurity-induced hunger. Therefore, this cross-
47 sectional analysis aims to assess the association between binge drinking and FI with hunger,
48 physical activity, racial minority status, and Body Mass Index (BMI) percentile among Vermont
49 high school students.

50 **Methods**

51 We conducted a cross-sectional study to determine the association of binge drinking with
52 behavioral risk factors among high school students. We used data from the 2019 Vermont
53 Youth Risk Behavior Survey (YRBS) to conduct our analysis. Our full sample consisted of 18,540
54 subjects. YRBS respondents who were enrolled in high school and between the ages of 12 to 18
55 years were included in this study.

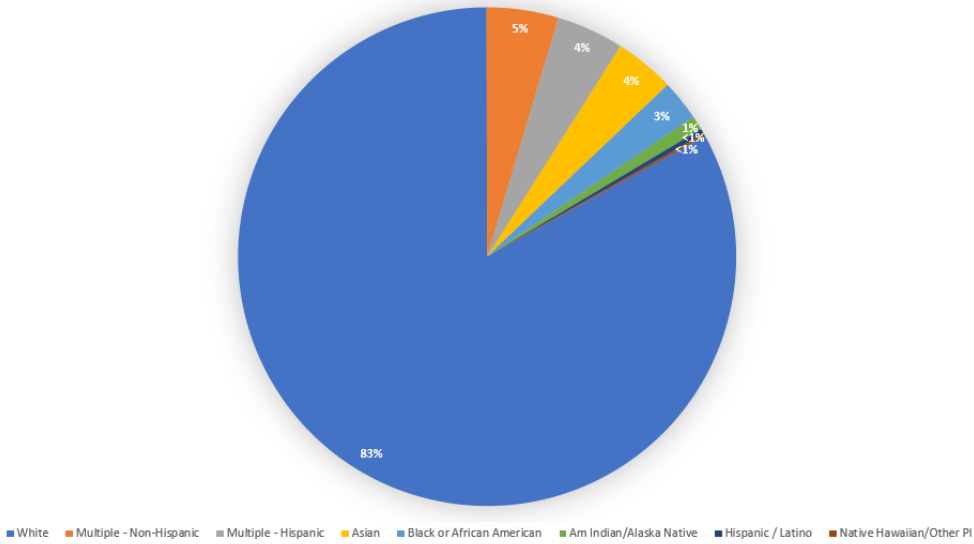
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57 A multiple logistic regression model was used to assess potential predictors for binge drinking
58 among high school students, including Food Insecurity (FI) with hunger, Physical Activity (PA),
59 Black Indigenous People Of Color status (BIPOC) status, sex, and BMI percentile. The predictor
60 variables were all dichotomous with the exception of BMI percentile, which is continuous. FI
61 with hunger was defined as hunger in the last 30 days due to a lack of food in the home.
62 Sufficient PA was defined as participating in PA for 60 minutes per day on at least 5 or more
63 days. For BIPOC status, participants identifying as American Indian/Alaska Native, Asian, Black,
64 or African American, Native Hawaiian/other pacific Islander, Hispanic/Latino, or Multiple
65 Hispanic/Non-Hispanic were coded as the binary exposure variable; "BIPOC-Black Indigenous
66 People of Color, leaving the remaining participants coded as "White." Some YRBS respondents
67 provided height and weight values that were used to calculate their Body Mass Index percentile

68 score.⁷ Participants who had missing values for this variable and the other predictors were
 69 excluded from analysis. Respondents were classified as binge drinkers based on the “5+/4+
 70 definition,” where males were classified as binge drinkers if they reported drinking 5 or more
 71 drinks in about 2 hours in the past 30 days, and for females, 4 drinks in about 2 hours.⁸
 72 IBM SPSS Statistics version 26 was used to analyze our data and conduct weighted logistic
 73 regression. The alpha for this analysis was set at 0.05. The University of Vermont Institutional
 74 Review Board has reviewed this project and determined that it qualifies as exempt from
 75 additional review.

76 **Results**

77 After excluding participants who had a missing value for binge drinking (n=1,229), a total of
 78 17,311 cases were included in the analysis. Of these cases, 2,485 (14.4%) of participants
 79 between the ages of 12 to 18 reported binge drinking in the previous 30 days. A total of 15,226
 80 (83%) students identified as White (83%) and 3,387 (17%) identified as BIPOC (Figure 1). There
 81 were 7,828 participants with sufficient PA, 1,210 of which were binge drinkers. Out of 1,189
 82 students reporting FI with hunger, 287 were binge drinkers. Participants identifying as female
 83 accounted for 8,605 of the sample, and participants identifying as male accounted for 8,636 of
 84 the sample.



85
 86 **Figure 1.** Race and ethnicity distribution of Vermont High School Students, 2019.

87 Binge drinkers were nearly twice as likely to report FI with hunger (OR = 1.96; 95% CI = 1.69,
 88 2.30) in the household compared to non-binge drinkers. Conversely, binge drinkers were 19%
 89 more likely to engage in sufficient PA (OR = 1.19; 95% CI = 1.09, 1.30) compared to their non-
 90 binge drinking counterparts (Table 1). Furthermore, BIPOC students were 19% less likely to
 91 engage in binge drinking as opposed to White students (OR = 0.81; 95% CI = 0.71, 0.93).

92 There was no association between binge drinking on BMI Percentile (OR = 1.0; 95% CI = 1.00,
 93 1.00). Females were slightly (15%) more likely than males to engage in binge drinking (OR =
 94 1.15; 95% CI = 1.05, 1.26). Nagelkerke R² value was 0.01.

95 **Table 1** - Associations Between Selected Determinants of Health and Binge Drinking Among
 96 Vermont High School Students, 2019
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TABLE 1 - Bivariate Logistic Associations between Determinants of Youth Health and Binge Drinking in Vermont High School Students, 2019

	OR (95% CI) of Binge Drinkers vs Non Binge Drinkers
FI with Hunger, y	1.96 (1.69, 2.30)
No FI with Hunger	1 (Ref)
Sufficient PA	1.19 (1.09, 1.30)
Without Sufficient PA	1 (Ref)
BIPOC	0.81 (0.71, 0.93)
White	1 (Ref)
One Percent BMI Percentile Increase	1.0 (1.00, 1.00)
BMI Percentile	1 (Ref)
Female	1.15 (1.05, 1.26)
Male	1 (Ref)

Note: CI = confidence interval; OR = odds ratio. ORs defined from Exp (B)'s and 95% CIs were estimated using bivariate multiple logistic regression. Nagelkerke R²= 0.01

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Discussion

118 Interest in the impact of binge drinking on physical activity and food insecurity with hunger
119 among adolescents continues to grow⁹. The current study examined whether PA levels and FI
120 with hunger are related to binge drinking among high school students in Vermont. Our results
121 showed that food insecurity with hunger was positively related to binge drinking. These findings
122 are in line with recent studies that have shown a causal relationship between self-reported
123 food insecurity and increased consumption of alcohol among high school students^{9,10}.

124 The findings show that sufficient physical activity was positively linked to binge drinking
125 behaviors. This finding is in line with evidence in the existing literature that indicates a positive
126 relationship between increased physical activity and binge drinking among high school
127 students. Specifically, other researchers have reported that high school students who
128 consumed one or more alcoholic drinks within a month were more likely to be physically active
129 than high school students who had not consumed alcohol¹¹. Along similar lines, previous
130 studies have pointed out that PA is directly correlated with alcohol use among high school
131 students¹².

Limitations

133 Our study was conducted using self-reported responses. Because of this, the results reported
134 may be subject to self-report bias.

135
136 Additionally, we were limited to the data provided by the state of Vermont. The variable
137 related to FI with hunger in this study was limited due its categorization based on one question
138 in the YRBS. We could not determine the level of food insecurity without more detailed
139 socioeconomic information.

140
141 Nonresponse bias is a potential form of bias in our study, and was minimized by the Vermont
142 Department of Health through their YRBS questionnaire design and survey environment⁶.

Conclusion

144 The relationship between binge drinking, PA, and FI with hunger has been well-researched in
145 adults but these health behaviors have not been well-studied collectively among
146 adolescents. This study, which utilized the 2019 Vermont YRBS, found that FI with hunger and a
147 higher level of PA were significant risk factors for binge drinking in high school students.
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149 Our study’s findings provide evidence for additional consideration of community-focused
150 interventions that address food insecurity, healthy physical activity behaviors, and anti-
151 substance abuse policies.

152
153 Public health and school health practitioners can implement multi-approach strategies that
154 include informational health and wellness education campaigns as well as promotion of
155 targeted prevention programs that highlight the risks of binge drinking and discourage alcohol
156 abuse. Increasing PA and sports programs in schools may also prove beneficial for lessening the
157 odds of binge drinking. School health services staff and primary care providers should screen
158 for symptoms of food insecurity and binge drinking among adolescents, provide appropriate
159 care for observed health conditions, and offer help resources as needed.

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161 Additional research to identify and understand the role of FI with hunger on PA and alcohol
162 abuse is critical. Adolescents experiencing FI with hunger may have additional needs and social
163 determinants of health that can help inform public health decisions and policy changes needed
164 to improve their overall health and well-being.

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