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Original article

The Effect of Social and Stress-Related Factors on Alcohol Use Among College Students During the Covid-19 Pandemic

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A B S T R A C T

Purpose: The aim of this article is to study how Covid-19 stress-related factors and changes in social engagement during the pandemic contributed to changes in alcohol use among first-year college students.
Methods: We used data on 439 first-year students (ages 18–20) at a large public university in North Carolina both before (October 2019 to February 2020) and after (June/July 2020) the start of the Covid-19 pandemic. We evaluated changes in prevalence and days of alcohol use and binge drinking. We estimated the associations between Covid-19 stressors/stress (work reductions, health, distanced learning difficulties, perceived stress) and social engagement (perceived social support from friends, social isolation, and social distancing) after controlling for students' pre-pandemic alcohol use, social engagement, and demographic characteristics.
Results: We found that the prevalence of alcohol use and binge drinking in the past 30 days decreased from 54.2% to 46.0% and 35.5% to 24.6%, respectively; days of use did not change significantly. The decreases were primarily associated with reductions in social engagement. Among Covid-19 stressors/stress, only challenges with distance learning were associated with higher alcohol use among those who were already drinking prior to the pandemic. Drinking increased more among those who endorsed using substances to cope, while drinking was not associated with resilient coping.
Conclusions: Unless new drinking habits are formed during the pandemic, decreases in alcohol use among college students are unlikely to be sustained as social distancing measures are removed. Colleges may want to target interventions to students who have responded to stress with increased alcohol use, partly by addressing difficulties with distance learning.
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IMPLICATIONS AND CONTRIBUTION

Alcohol use among college students is strongly facilitated through social activities. By reducing social engagement, the Covid-19 pandemic has reduced alcohol use among college students. Covid-19 stressors/stress, particularly difficulties with distanced learning, were associated with increased alcohol use, but only for students who were already drinking prior to the pandemic.

Alcohol use is a leading cause of preventable mortality worldwide [1]. College age students are of particular public health interest due to high rates of alcohol use, the associated

risk of habit formation, and the direct health consequences of binge drinking, including heightened risk of sexual assault and other types of violence [2]. The Covid-19 pandemic dramatically impacted the college experience, decreasing opportunities to socialize and increasing exposure to myriad stressors, from health concerns to job loss to remote learning.

Previous studies have found that college students drink alcohol in response to stress [3–6], which could foreshadow

increases in alcohol use during the pandemic. At the same time, alcohol use may have decreased given fewer opportunities to drink socially due to campus closures and social distancing policies. Previous research suggests that social motives for alcohol use are particularly important for college students [7–9], and more important than coping motives [10]. Yet the pandemic's unprecedented effects on social and stress-related factors leave the overall effects on alcohol use ambiguous.

A growing literature has investigated the effects of the pandemic on alcohol use among adolescents, young adults, and college students in the U.S. and found mixed results [11–23]. Decreases in opportunities to socialize related to the pandemic were associated with decreases in alcohol use among college students [11,12,18,20]. College students who changed residence to live with parents and those who believed that Covid-19 precaution-taking was important, which presumably was associated with fewer opportunities to socialize, decreased their alcohol use more than their peers [11,12,18–20]. Research has also found an important role for stressors in determining alcohol use among U.S. college students during the pandemic [24,25], along with associations between drinking to cope motives and heavier alcohol use [17,24]. One study found that coping motives for alcohol use increased, while social motives decreased during the pandemic [17].

Current study

First, we test a rich set of *Covid-19 stressors/stress* (including work reduction of self or parent/guardians, academic difficulties associated with distance learning, diagnosis or hospitalization related to Covid-19, and perceived stress from Covid-19) and *social engagement* factors (including perceived social support from friends, social isolation, and social distancing). Because studies have also found associations between anxiety and depression symptoms and both Covid-19 stress and alcohol use during the pandemic [13,14,26], we check robustness to controlling for anxiety and depression symptoms.

Second, we focus on students who are in their first year of college and under the age of 21. Because any alcohol use is considered heavy drinking or problem drinking among underage students, we consider any alcohol use in addition to days of alcohol use and binge drinking [2]. The National Institute of Alcohol Abuse and Alcoholism defines binge drinking to be five or more drinks on a single occasion, if male and four or more if female [27]. Binge drinking has been shown to have particularly negative consequences [9].

Third, we follow the same students over time; Wave I (W1) took place between October 2019 and February 2020, prior to the pandemic, and a follow-up survey (Wave II; W2) was conducted 4 months into the pandemic (June/July 2020; *mid-pandemic*). The longitudinal data allow us to assess underlying determinants of drinking behaviors after accounting for important confounds, namely pre-existing alcohol use and social factors.

Fourth, given the importance of coping strategies in the literature [24,28], we consider associations between coping strategies and alcohol use in combination with stress- and social-related factors. Assessing the potential protective effects of resilient coping is particularly novel.

We hypothesize that Covid-19 stressors/stress will be associated with increased alcohol use and that reductions in social engagement will be associated with decreased alcohol use mid-pandemic. We further hypothesize that stress-related and social engagement factors will be more strongly associated with alcohol use among those who were using alcohol prior to the pandemic, given lower barriers to drinking in this population [6]. Finally, we hypothesize that resilient coping will be associated with lower alcohol use, but students who endorse using alcohol or other drugs (AOD) to cope with the pandemic will have higher alcohol use.

Methods

Data

We use survey data collected via two 25-minute Qualtrics surveys completed online. W1 was initiated in October/November 2019 with an email invitation to a random sample of in-state, first-year college students age 18 or older and enrolled in the selected public university. In January/February 2020, we expanded the sample to include all enrolled first-year students. Participants who did not respond to the initial email invitation were sent a follow-up invitation offering a $10 gift card. In June/July 2020, roughly 4 months after the start of the pandemic, we invited all W1 respondents who indicated a willingness to participate in additional surveys (N = 738) to complete a follow-up survey and offered participants a $15 gift card. Consistent with many online surveys [29], our W1 response rate was 32% (N = 1,124). Our W2 response rate was 64% (N = 474). Our analytic sample includes 439 participants who completed both the W1 and W2 surveys and have no missing data on drinking behaviors. This study was approved by the university's Institutional Review Board.

Setting

Data were collected at a large public university in North Carolina (NC). The Governor of NC issued a stay-at-home order in late March. At about the same time, the university made the decision to send most students home and moved classes online for the remaining 5 weeks of the semester and summer sessions. The stay-at-home order was lifted in mid-May, about 30 days before the survey was sent out, and average Covid-19 cases were rising in NC [30]. Ninety percent of respondents reported living at home with their parent/guardian at W2.

Measures

Alcohol use and binge drinking (W1 and W2). We measured alcohol use and binge drinking at each wave using questions derived from the Youth Risk Behavior Surveillance System: (1) "Over the past 30 days, on how many days did you have at least one drink of alcohol?" and (2) "Over the past 30 days, on how many days did you have four or more drinks in a row, that is within a couple of hours, if you are female; five or more drinks in a row if you are male?" [31]. Potential responses included 0 days, 1 or 2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, and all 30 days. We created separate indicators (0/1) of any alcohol use and any binge drinking for college students reporting one or more days of alcohol use or binge drinking, respectively. We created number of days of alcohol use and of binge drinking variables by calculating the midpoint of the range of days reported (rounding to the nearest integer).

Covid-19 stressors/stress (W2). First, we measured two economic stressors—student and parent work reductions. We created separate indicators (0/1) for parent and student work reductions respectively based on whether the students responded that they or their parents had lost a paid job, were furloughed, or had their hours reduced. Second, we measured educational stressors that assessed difficulties with academics since the Covid-19 pandemic began. These items were developed in collaboration with an undergraduate research team. They were evaluated on a 4-point Likert scale (*not difficult at all*, *somewhat difficult*, *moderately difficult*, *very difficult*). An exploratory factor analysis of responses identified two factors—distance learning and educational technology. For each factor, we calculated standardized factor scores (mean 0, standard deviation 1). The higher factor scores for distance learning indicate greater difficulties with finding support needed for courses (e.g., tutoring and office hours), accessing the learning materials needed, adapting to the distanced learning format, finding a quiet space to work, and making time for course work. Higher factor scores for education technology indicate greater difficulties with accessing the internet and obtaining the technology (e.g., computers and software) needed for distance learning.

Third, we measured Covid-19 health stressors. We created separate indicators (0/1) for Covid-19 diagnosis and hospitalization, respectively, for whether students, their family members, or their friends had been diagnosed with Covid-19 or hospitalized with Covid-19. Finally, we measured the extent to which students reported feeling stressed or worried at least two or three times a week about Covid-19. We created three categories for Covid-19 perceived stress (high, moderate, and low) for those who responded *very much*, *moderate*, and *very little/none,* respectively.

Social engagement. First, we measured social isolation (0/1) at W1 and W2 based on whether a student reported feeling isolated from others *always/usually* compared to *sometimes/ rarely/never* [32]. Second, we measured perceived social support from friends, based on the friend components of the Multidimensional Scale of Perceived Social Support at W1 and W2 [33]. We averaged four domain-specific questions whose responses ranged from 1 (strongly disagree) to 5 (strongly agree) and standardized the scale to have mean 0, standard deviation 1. Cronbach's alpha was good (.90 in W1 and W2). Third, we created three categories for social distancing (high, moderate, and low) for students who *strongly agreed*, *agreed*, and *neither agreed nor disagreed/disagreed/strongly disagreed* respectively with "having taken every precaution I can to avoid getting or spreading Covid-19, such as social distancing or washing hands regularly."

Coping (W2). First, we measured resilient coping using the 4-item Brief Resilient Coping Scale [34]. Based on the sum of these items, we defined three categories—low-resilient (scores less than 13), medium-resilient (scores of 13—17), and high-resilient copers (scores greater than 17), based on thresholds developed in the literature [34]. Cronbach's alpha was .55 in W2, which is lower than reported in the original evaluation (.64—.71) [34], but marginally reliable [35]. Second, we created an indicator (0/1) for whether students endorsed using AOD to help them through the pandemic *a lot/medium amount/a little bit* compared to *not at all.*

Mental health (W1 and W2). We measured depression and anxiety symptoms using the Patient Health Questionnaire depression scale (PHQ-8) and the Generalized Anxiety Disorder assessment (GAD-7). Scores for the PHQ-8 range from 0 to 24 with 10 or more indicating moderate—severe depression [36]. Scores for the GAD-7 range from 0 to 21 with 10 or more indicating moderate—severe anxiety [37]. We created a single dichotomous (0/1) variable to indicate whether respondents had moderate—severe anxiety or depression symptoms at each wave. In our data, Cronbach's alphas was good (.90 in W1 and W2 for GAD-7; .87, W1 and .89, W2 for PHQ-8).

Other controls. W1 data include key demographics—race/ ethnicity, male/female sex, sexual orientation, gender identity, and age. Students also reported whether they received free or reduced-price lunch in high school, a rough proxy for low income. We classified students as Hispanic if they reported Hispanic ethnicity regardless of race, and non-Hispanic (NH) students as NH black, NH white, NH Asian, and NH other for any other race/ethnicity, including mixed-race students. We defined a sexual or gender minority student to be someone who reported any sexual orientation other than heterosexual, a transgender identity, or a gender identity other than their sex at birth. Fewer than five individuals self-classified as gender minorities. We defined a first-generation college student to be someone who reported that neither parent nor guardian completed a 4-year post-secondary degree. We defined an employment indicator based on whether the student reported being employed in February 2020 prior to the pandemic.

Analysis

First, we compared characteristics of the longitudinal sample to those only in the W1 sample. Second, we examined changes from W1 (pre-Covid) to W2 (mid-Covid) in alcohol use, days of alcohol use, binge drinking, and days of binge drinking. Third, we estimated logistic regression models of any alcohol use and any binge drinking, and negative binomial regression models of days of alcohol use and days of binge drinking to deal with overdispersion due to the count nature of these variables. All models were estimated as a function of Covid-19 stressors/stress and social engagement variables. We performed *F*-tests of the joint significance of (1) the Covid-19 stressors/stress and (2) social engagement variables. Other control variables included alcohol use, social isolation, perceived social support from friends, employment, and demographic characteristics measured at W1. Additionally, all models controlled for an indicator for the timing of the W1 survey response and an indicator variable for the week of the W2 survey to control for the changing nature of the first year in college and the pandemic. We used mean imputation with missing indicators (0/1) for a small number of missing control variables. We found that results were similar when we controlled for moderate—severe anxiety or depression symptoms in W1 and W2 (results not shown). Fourth, we re-estimated models for each of our outcomes of interest among college students who reported any alcohol use in W1. Finally, we re-estimated the model with the addition of Brief Resilient Coping Scale and coping with AOD.

We report odds ratios for logistic regressions and rate ratios for negative binomial (i.e., the proportion change in the dependent variable for any unit change in the independent variable). We also report marginal effects (i.e., the change in

probability of the outcome for a small or discrete change in an explanatory variable) for all regressions. We focus on marginal effects rather than odds ratios because odds ratios cannot be compared across model specifications when the sample changes or additional covariates are added, whereas marginal effects can be compared [38].

Results

Sample characteristics

The longitudinal sample did not differ from the sample which only responded to W1 on most characteristics. The exceptions were a higher percentage female (.72 compared to .64), lower W1 days of binge drinking (1.26 compared to 1.71), and higher social isolation (.23 compared to .17) in the longitudinal compared to the W1-only sample (Table 1). Our longitudinal sample was 60.1% NH white, 7.3% NH black, 17.8% NH Asian, and 9.4% Hispanic. This is roughly comparable to the reported demographics of the university's first-year student population in

Table 1
Comparisons of means between wave I respondents only (those Not in longitudinal sample) and longitudinal sample

	Wave I respondents only sample			Longitudinal sample		
	Mean	SE	N	Mean	SE	N
Demographics						
Age	18.95	.021	619	18.90	.018	427
Non-Hispanic white	.641	.019	668	.601	.023	439
Non-Hispanic black	.069	.010	668	.073	.012	439
Non-Hispanic Asian	.144	.014	668	.178	.018	439
Hispanic	.084	.011	670	.094	.014	438
Non-Hispanic other race	.063	.009	668	.055	.011	439
Female	.638	.019	665	.720**	.021	439
First generation	.164	.015	628	.188	.019	437
Sexual/gender minority	.152	.014	643	.178	.019	426
Free/reduced price lunch	.152	.015	611	.167	.018	419
Responded in January or February 2020	.736	.017	685	.740	.021	439
Alcohol use (Wave I)						
Any alcohol use	.508	.022	528	.542	.024	439
Any binge alcohol use	.378	.021	534	.355	.023	439
Days of any alcohol use	2.568	.165	528	2.508	.163	439
Days of binge alcohol use	1.710	.147	534	1.262*	.106	439
Social variables (Wave I)						
Social isolation	.170	.016	547	.233*	.020	437
MSPSS-Friends	4.112	.032	546	4.096	.038	436
Mental health (Wave I)						
Moderate to severe anxiety and/or depression symptoms	.282	.019	585	.295	.022	431

Note: Statistical significance of differences between Wave I only and longitudinal sample was assessed by Pearson's chi-squared tests for categorical and dichotomous variables and *t*-tests for continuous variables.
MSPSS = Multidimensional Scale of Perceived Social Support; SE = standard error.
**$p < .01$.
*$p < .05$.

2019: 20%—55.7% NH white, 8.9% NH black, 12.3% NH Asian, and 9% Hispanic [39].

Changes in alcohol use

The prevalence of alcohol use decreased from 54.2% to 46.0% from pre- to mid-pandemic; binge drinking decreased from 35.5% to 24.6% (Table 2). In contrast, days of alcohol use and binge drinking over the past month did not change significantly.

Associations with Covid-19 stressors/stress and social engagement

We identified two main results from regressions estimating associations between Covid-19 stressors/stress and social engagement with our alcohol use outcomes—any alcohol use, days of alcohol use (Table 3, Model 1), any binge drinking, days of binge drinking (Table 4, Model 1) over the past month—while controlling for a rich set of pre-pandemic characteristics. First, we found that none of the Covid-19-related stressors/stress were associated with prevalence or intensity of alcohol use or binge drinking, either individually or jointly.

Second, for social engagement, we found that students who reported moderate/high Covid-19 social distancing had lower alcohol use than low social distancers during the pandemic (by 10.3/19.0 percentage points) and binge drinking (by 9.74/17.9 percentage points). High social distancers also had fewer days of alcohol use and binge drinking (by 1.84 and 2.16 days) than low social distancers. Social support from friends was positively associated with all but the incidence of binge drinking. A one standard deviation increase in perceived social support from friends was associated with an increased probability of any alcohol use (by 6.43 percentage points), an increase in days of alcohol use (by 1.42 days), and binge drinking (by .81 days). This was true after controlling for perceived social support from friends at W1. Social isolation was not associated with drinking behaviors.

Associations for those who were drinking pre-pandemic

Next, we estimated associations of Covid-19 stressors/stress and social engagement among college students who reported any alcohol use at W1. Among these students, we found that general difficulties with distance learning were associated with increases in alcohol use (Table 3, Model 2) and days of binge drinking (Table 4, Model 2) over the past month. A one standard deviation increase in difficulties with distance learning were associated with a 9.09 percentage point increase in the probability of alcohol use, 1.25 more days of alcohol use, and .70 more days of binge drinking. Other Covid-19 stressors/stress (i.e., work reductions, educational technology, diagnosis/hospitalization, and perceived Covid-19 stress) were not statistically significantly associated with alcohol use or binge drinking for these students.

We found that associations with social engagement variables were generally comparable to the overall sample. An exception was that high social distancing had larger associations with alcohol use for these students compared to the overall sample (35.0 compared to 19.0 percentage points lower alcohol use and 2.31 compared to 1.84 lower days of alcohol use); effects were comparable across the two samples for binge drinking. Perceived social support from friends had a comparable effect on this sample as the overall sample, though effects were not

Table 2
Pre- and mid-pandemic comparison of rates of alcohol use among the longitudinal sample (N = 439)

Prevalence	Pre-pandemic (Wave I)		Mid-pandemic (Wave II)		Wave II—Wave 1	Significance
	Percentage	Frequency	Percentage	Frequency	Percentage point difference	p-value
Any alcohol use	54.2%	238	46.0%	202	−8.2%	.015
Any binge alcohol use	35.5%	156	24.6%	108	−10.9%	<.001
Days of use	Mean	SD	Mean	SD	Difference of means	p-value
Days of any alcohol use	2.51	3.42	2.57	4.48	.0592	.826
Days of binge alcohol use	1.26	2.22	1.05	2.74	−.214	.204

Statistical significance of differences in alcohol use between Wave I and Wave II was assessed by Pearson's chi-squared tests for prevalence and t-tests for days of use. SD = standard deviation.

statistically significantly different from 0 for binge drinking. Finally, social isolation continued to not be associated with drinking.

Associations with coping

Finally, we considered whether resilient coping and coping with AOD were associated with drinking behaviors in our full sample (Table 5). Medium- and high-resilient copers were no less likely to drink alcohol during the pandemic than low-resilient copers. In contrast, students who endorsed coping with AOD were significantly more likely to drink than their peers who did not endorse coping with AOD (by 21.6 percentage point for any alcohol use, 3.96 days of alcohol use, 25.2 percentage points for binge drinking and 3.88 days of binge drinking).

Discussion

This study examined the associations of Covid-19 stressors/stress and social engagement factors with alcohol use and binge drinking among 5-year college students during the pandemic. We did not find support for our first hypothesis that Covid-19 stressors/stress would be associated with increased alcohol use for the population overall. However, we found strong support for our second hypothesis that reductions in social engagement, particularly decreases in perceived social support from friends and social distancing, would be associated with decreased alcohol use. This helps explain the overall declines in alcohol use and binge drinking that we observed in our population from pre- to mid-pandemic. The overall dominance of the social motive for drinking in this age group is supported by the literature [10] and points to the power of the environment over drinking-related behaviors of college students [11,12,18].

At the same time, we did find some evidence that Covid-19 stressors/stress affected alcohol use among college students who were already drinking prior to the pandemic. For these students, difficulties with distance learning were associated with increases in alcohol use and binge drinking, but other stressors—work reductions, sickness/hospitalization from Covid-19, and perceived Covid-19 stress—did not matter. Finally, we found that resilient coping did not serve as a protective factor, whereas alcohol use was much higher for those who endorsed coping through AOD.

The present study provided critical insights into the role of a broad range of social and stress-related factors on alcohol use of college students under the legal drinking age during the pandemic. The longitudinal data permitted us to control for a rich set of pre-pandemic traits, including W1 alcohol use and social engagement, eliminating key confounds. Yet, several limitations will need to be addressed in future research. First, it would be useful to know how frequently students spend time with friends in person to understand more deeply the opportunities for drinking. Second, it would be useful to conduct a follow-up study during the semester where academic stress would be heightened and more students would be living with friends or on/near campus as well as with parents/guardians. Third, we lost 7% of our sample due to missing reports of alcohol use, which may be problematic if these are not missing at random. Our longitudinal sample is comparable to the W1 sample on most but not all characteristics. Combined with the particularly low response rates in W1, this means that our sample may not be fully representative of all first-year students at this university. Fourth, finer-grained measures of days of alcohol use and binge drinking may have produced more precise estimates. Finally, this study was focused on a single university and first-year students. Research on alcohol use among college students should be expanded to other years and universities.

In light of the strain of the pandemic on mental health, wellness, and learning for college students [26,40], this study provides modestly good news. Underage and excessive drinking in college students is problematic for a variety of reasons including increased risk of mortality, assault, academic problems, and future alcohol use disorders [2]. The dominance of the social motive for drinking is troubling as it suggests that alcohol use may increase again once students return to campus and social distancing measures are lifted. That said, lower levels of alcohol use may persist if instead students formed alternative habits of drinking and patterns of socializing during the pandemic. For the students who were already drinking prior to the pandemic, helping them to manage stress, particularly stress associated with distance learning, would be helpful. This could be through academic coaching support, counseling centers, or student support groups. For the broader set of students for whom the social motive dominates, providing safe opportunities to interact with their peers and education about the risks of alcohol use may be most beneficial.

Funding Sources

Table 3
Logistic and negative binomial regression estimates for any alcohol use and days of any alcohol use among the longitudinal sample (N = 439) and among students with any Wave I alcohol use (N = 238)

	Any alcohol use				Days of any alcohol use			
	Model 1		Model 2		Model 1		Model 2	
	Odds ratio (95% CI)	Marginal effects (SE)	Odds ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)
Covid-19 stressors/stress								
Student work reduction	.515 (.221–1.200)	−.0961 (.0622)	.438 (.115–1.672)	−.123 (.101)	.984 (.582–1.665)	−.0545 (.915)	1.031 (.652–1.628)	.130 (1.005)
Parent work reduction	.926 (.525–1.635)	−.0111 (.0420)	1.017 (.448–2.305)	.00245 (.0623)	.890 (.627–1.263)	−.397 (.618)	.923 (.663–1.287)	−.342 (.729)
Distance learning	1.321 (.971–1.797)	.0403 (.0224)	1.839* (1.097–3.082)	.0909 (.0363)	1.062 (.882–1.279)	.205 (.322)	1.337** (1.115–1.604)	1.251** (.435)
Education technology	1.084 (.812–1.445)	.0116 (.0213)	1.048 (.700–1.568)	.00702 (.0306)	1.000 (.851–1.175)	−.000592 (.282)	.957 (.815–1.124)	−.190 (.354)
Covid-19 diagnosis: self or other	1.436 (.802–2.573)	.0524 (.0428)	2.164 (.875–5.354)	.115 (.0683)	1.032 (.728–1.465)	.109 (.611)	1.076 (.793–1.462)	.317 (.671)
Covid-19 hospitalization: self or other	1.181 (.401–3.476)	.0240 (.0796)	.699 (.144–3.390)	−.0533 (.121)	.858 (.515–1.429)	−.523 (.903)	.820 (.516–1.303)	−.852 (1.035)
Covid-19 stress: low	Reference							
Covid-19 stress: moderate	1.230 (.642–2.356)	.0300 (.0479)	1.393 (.557–3.488)	.0495 (.0694)	.824 (.562–1.207)	−.663 (.675)	1.163 (.819–1.651)	.649 (.783)
Covid-19 stress: high	1.021 (.499–2.088)	.00297 (.0529)	.949 (.352–2.561)	−.00777 (.0755)	1.262 (.800–1.991)	.795 (.822)	1.018 (.634–1.633)	.0763 (1.039)
Social engagement								
Social isolation	.686 (.360–1.307)	−.0545 (.0476)	.831 (.321–2.151)	−.0276 (.0721)	1.131 (.707–1.809)	.421 (.828)	1.503 (.942–2.399)	1.754 (1.060)
MSPSS-Friends	1.559* (1.035–2.350)	.0643* (.0296)	1.894* (1.043–3.439)	.0953* (.0440)	1.514** (1.175–1.950)	1.416** (.512)	1.384* (1.076–1.781)	1.399* (.583)
Social distancing: low	Reference							
Social distancing: moderate	.492* (.258–.939)	−.103* (.0473)	.322* (.108–.966)	−.169* (.0838)	.723 (.477–1.095)	−1.108 (.757)	.879 (.607–1.273)	−.554 (.814)
Social distancing: high	.270*** (.126–.578)	−.190*** (.0527)	.0958*** (.0312–.294)	−.350*** (.0766)	.584* (.361–.945)	−1.838* (.896)	.585* (.375–.913)	−2.308* (1.010)
p-values from tests of joint significance of Covid-19 stressors/stress and social engagement variables								
Covid-19 stressors/stress	.171		.208		.437		.185	
Social engagement	<.001		<.001		.002		.015	
Among students with any W1 alcohol use	No		Yes		No		Yes	
N	437		226		439		238	

All models control for W1 alcohol use (any alcohol use for columns 1–2, days of alcohol use columns 5–8), demographic characteristics (age, race, gender, first-generation college student status, sexual/gender minority identity, and free/reduced price lunch eligibility), W1 employment, W1 social variables (social isolation, MSPSS-Friends subscore), the week in which the student responded to W2, the period in which the student responded to W1 (October/November 2019 or January/February 2020), missing indicators (for demographic characteristics, Covid-19 stressors/stress, and W1 and W2 social variables), and a constant. Sample sizes under 439 (Model 1) or 238 (Model 2) are due to loss of observations perfectly predicted by our model.
CI = confidence interval; MSPSS = Multidimensional Scale of Perceived Social Support; SE = standard errors; W1 = Wave I; W2 = Wave II.
***p < .001.
**p < .01.
*p < .05.

Table 4
Logistic and negative binomial regression estimates for binge alcohol use and days of binge alcohol use among the longitudinal sample (N = 439) and among students with any Wave I alcohol use (N = 238)

	Binge alcohol use				Days of binge alcohol use			
	Model 1		Model 2		Model 1		Model 2	
	Odds ratio (95% CI)	Marginal effects (SE)	Odds ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)
Covid-19 stressors/stress								
Student work reduction	.678 (.317–1.448)	−.0531 (.0526)	.485 (.187–1.262)	−.130 (.0866)	1.159 (.576–2.331)	.216 (.525)	1.094 (.579–2.069)	.156 (.564)
Parent work reduction	.987 (.568–1.716)	−.00180 (.0385)	1.033 (.529–2.016)	.00582 (.0615)	.816 (.513–1.298)	−.298 (.351)	.837 (.524–1.338)	−.308 (.420)
Distance learning	1.101 (.820–1.479)	.0132 (.0205)	1.346 (.934–1.939)	.0536 (.0331)	1.094 (.848–1.410)	.131 (.191)	1.498** (1.158–1.939)	.700** (.269)
Education technology	1.147 (.877–1.500)	.0187 (.0185)	1.096 (.767–1.567)	.0165 (.0327)	1.123 (.918–1.376)	.171 (.160)	.967 (.763–1.226)	−.0576 (.209)
Covid-19 diagnosis: self or other	1.314 (.676–2.555)	.0373 (.0461)	1.391 (.654–2.960)	.0596 (.0690)	1.044 (.618–1.763)	.0631 (.392)	1.025 (.627–1.675)	.0429 (.434)
Covid-19 hospitalization: self or other	.599 (.218–1.647)	−.0699 (.0697)	.490 (.171–1.401)	−.129 (.0954)	1.222 (.509–2.932)	.293 (.653)	.658 (.295–1.465)	−.725 (.733)
Covid-19 stress: low	Reference							
Covid-19 stress: moderate	1.070 (.582–1.966)	.00921 (.0423)	.959 (.445–2.068)	−.00755 (.0707)	1.131 (.680–1.880)	.180 (.379)	1.274 (.785–2.066)	.419 (.433)
Covid-19 stress: high	.559 (.224–1.395)	−.0794 (.0621)	.372 (.122–1.130)	−.178 (.0960)	1.476 (.679–3.210)	.571 (.609)	1.043 (.489–2.225)	.0736 (.671)
Social engagement								
Social isolation	.914 (.449–1.858)	−.0123 (.0494)	.984 (.406–2.385)	−.00283 (.0814)	1.264 (.648–2.465)	.343 (.515)	1.483 (.729–3.016)	.682 (.656)
MSPSS-Friends	1.399 (.908–2.158)	.0459 (.0304)	1.255 (.750–2.101)	.0410 (.0473)	1.738** (1.241–2.435)	.810* (.316)	1.432* (1.007–2.038)	.622 (.340)
Social distancing: low	Reference							
Social distancing: moderate	.490* (.263–.911)	−.0974* (.0429)	.639 (.286–1.428)	−.0808 (.0736)	.515* (.291–.912)	−.973 (.516)	.880 (.504–1.536)	−.222 (.497)
Social distancing: high	.270*** (.127–.575)	−.179*** (.0507)	.316* (.130–.773)	−.208** (.0786)	.230*** (.115–.460)	−2.155** (.782)	.466* (.228–.952)	−1.322 (.689)
p-values from tests of joint significance of Covid-19 stressors/stress and social engagement variables								
Covid-19 stressors/ stress	.194		.214		.074		.093	
Social engagement	.003		.084		<.001		.077	
Among students with any W1 alcohol use	No		Yes		No		Yes	
N	430		235		439		238	

All models control for W1 alcohol use (binge alcohol use in columns 1–4 and days of binge alcohol use in columns 5–8), demographic characteristics (age, race, gender, first-generation college student status, sexual/gender minority identity, and free/reduced price lunch eligibility), W1 employment, W1 social variables (social isolation, MSPSS-Friends subscore), the week in which the student responded to W2, the period in which the student responded to W1 (October/November 2019 or January/February 2020), missing indicators (for demographic characteristics, Covid-19 stressors/stress, and W1 and W2 social variables), and a constant. Sample sizes under 439 (Model 1) or 238 (Model 2) are due to loss of observations perfectly predicted by our model.
CI = confidence interval; MSPSS = Multidimensional Scale of Perceived Social Support; SE = standard errors; W1 = Wave I; W2 = Wave II.
***p < .001.
**p < .01.
*p < .05.

Table 5
Logistic and negative binomial regression estimates for alcohol use and binge drinking among the longitudinal sample with coping variables (N = 439)

	Any alcohol use		Days of any alcohol use		Any binge alcohol use		Days of binge alcohol use	
	Odds ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)	Odds ratio (95% CI)	Marginal effects (SE)	Rate ratio (95% CI)	Marginal effects (SE)
Covid-19 stressors/stress								
Student work reduction	.465 (.194–1.116)	−.103 (.0592)	.884 (.538–1.453)	−.410 (.847)	.611 (.267–1.399)	−.0564 (.0482)	.905 (.458–1.787)	−.195 (.681)
Parent work reduction	.870 (.485–1.559)	−.0187 (.0399)	.852 (.617–1.177)	−.532 (.559)	.891 (.482–1.650)	−.0132 (.0359)	.805 (.535–1.210)	−.422 (.424)
Distance learning	1.309 (.957–1.792)	.0362 (.0212)	1.049 (.872–1.261)	.158 (.310)	1.136 (.786–1.643)	.0146 (.0212)	1.066 (.826–1.375)	.124 (.249)
Education technology	1.076 (.799–1.450)	.00986 (.0204)	1.037 (.881–1.220)	.120 (.278)	1.138 (.828–1.565)	.0148 (.0185)	1.216 (.986–1.500)	.382 (.277)
Covid-19 diagnosis: self or other	1.418 (.763–2.633)	.0468 (.0420)	1.083 (.778–1.506)	.264 (.565)	1.397 (.693–2.815)	.0383 (.0408)	1.119 (.691–1.812)	.219 (.480)
Covid-19 hospitalization: self or other	1.416 (.456–4.402)	.0467 (.0774)	1.146 (.681–1.929)	.454 (.884)	.694 (.205–2.350)	−.0418 (.0707)	1.478 (.633–3.451)	.760 (.906)
Covid-19 stress: low	Reference							
Covid-19 stress: moderate	1.088 (.559–2.120)	.0114 (.0457)	.760 (.530–1.090)	−.913 (.642)	.943 (.486–1.830)	−.00677 (.0387)	.768 (.463–1.275)	−.513 (.572)
Covid-19 stress: high	.928 (.426–2.022)	−.00998 (.0532)	.975 (.642–1.480)	−.0858 (.708)	.435 (.157, 1.207)	−.0953 (.0578)	.708 (.383–1.309)	−.672 (.649)
Social engagement								
Social isolation	.652 (.334–1.273)	−.0574 (.0457)	1.054 (.652–1.705)	.175 (.817)	.846 (.378–1.893)	−.0192 (.0469)	1.143 (.598–2.182)	.260 (.654)
MSPSS-Friends	1.497 (.958–2.339)	.0541 (.0302)	1.299* (1.018–1.657)	.871* (.432)	1.354 (.821–2.235)	.0347 (.0291)	1.454* (1.059–1.997)	.729 (.400)
Social distancing: low	Reference							
Social distancing: moderate	.638 (.325–1.250)	−.0604 (.0458)	.806 (.540–1.204)	−.717 (.708)	.595 (.296–1.192)	−.0595 (.0406)	.655 (.361–1.189)	−.823 (.740)
Social distancing: high	.343** (.153–.766)	−.144** (.0522)	.670 (.424–1.060)	−1.330 (.823)	.290** (.124–.681)	−.142** (.0491)	.318*** (.163–.621)	−2.229 (1.164)
Coping variables								
BRCS: low	Reference							
BRCS: medium	1.184 (.606–2.312)	.0226 (.0457)	1.372 (.918–2.050)	1.051 (.703)	1.976 (.855–4.564)	.0779 (.0477)	1.417 (.822–2.443)	.679 (.607)
BRCS: high	.669 (.308–1.452)	−.0539 (.0526)	1.081 (.712–1.643)	.260 (.704)	1.355 (.536–3.422)	.0347 (.0538)	1.090 (.566–2.099)	.168 (.650)
Coping with AOD	5.004*** (2.461–10.17)	.216*** (.0450)	3.286*** (2.399–4.501)	3.957*** (.805)	9.016*** (4.388–18.53)	.252*** (.0343)	7.326*** (4.619–11.62)	3.877** (1.437)
p-values from tests of joint significance of Covid-19 stressors/stress and social engagement variables								
Covid-19 stressors/ stress	.242		.608		.232		.081	
Social engagement	.008		.059		.026		<.001	
N	437		439		429		439	

All models control for W1 alcohol use (any alcohol use in columns 1–2, days of alcohol use in columns 3–4, any binge drinking in columns 5–6, and days of binge drinking in columns 7–8), demographic characteristics (age, race, gender, first-generation college student status, sexual/gender minority identity, and free/reduced price lunch eligibility), W1 employment, W1 social variables (social isolation, MSPSS-Friends subscore), the week in which the student responded to W2, the period in which the student responded to W1 (October/November 2019 or January/February 2020), missing indicators (for demographic characteristics, Covid-19 stressors/stress, W1 and W2 social variables, and coping measures), and a constant. Sample sizes under 439 are due to loss of observations perfectly predicted by our model.
AOD = alcohol or other drugs; BRCS = Brief Resilient Coping Scale; CI = confidence interval; MSPSS = Multidimensional Scale of Perceived Social Support; SE = standard error; W1 = Wave I; W2 = Wave II.
***p < .001.
**p < .01.
*p < .05.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2021.06.016.

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