

Research Article

Open Access

University Student Stress and Behavioral Health During the COVID-19 Pandemic

Sana Vora^{1*}, Christopher M. King¹, Rachel Bomysoad¹, Jill Del Pozzo²

¹Department of Psychology, Montclair State University, Montclair, NJ, USA

²Icahn School of Medicine at Mount Sinai, New York, NY, USA

Article Info

Article Notes

Received: September 24, 2024

Accepted: January 03, 2025

*Correspondence:

*Ms. Sana Vora, Department of Psychology, Montclair State University, Montclair, NJ, USA. Email: voras2@montclair.edu

©2025 Vora S. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License.

Keywords:

Mental health
Telepsychology
COVID-19
Pandemic
College
University
Student

Abstract

Higher education students have experienced increased stressors and behavioral health problems during the COVID-19 pandemic. The current study further investigated such phenomena in a sample of university students collected between June 2020 to December 2021. Students ($N = 1,441$) from a Mid-Atlantic public university were recruited via email lists and a psychology department research participant pool. The participants completed an online survey with items pertaining to demographic factors, biopsychosocial stressors, and measures of behavioral health functioning. All variables were examined descriptively, and regression analyses were used to examine hypothesized cross-sectional relationships between demographic factors and biopsychosocial stressors, on the one hand, and behavioral health functioning, on the other. Experiencing notable levels of biopsychosocial stressors was common, though a linear trend across semesters was not observed with respect to behavioral health functioning. Gender was the most consistent demographic predictor of behavioral health functioning, whereas the most common biopsychosocial stressor predictors for behavioral health functioning were stress/worry, social isolation, discrimination, and prior mental health services. Results corroborate and extend prior research evidencing notable levels of biopsychosocial stressors and behavioral health problems reported by higher education students during the COVID-19 pandemic. Implications for campus administrators and behavioral health providers concern vulnerabilities for a range of pandemic-time challenges being experienced by their constituents to which to attend.

Introduction

The COVID-19 pandemic brought with it many challenges—physical and safety, societal, and financial included.¹⁻³ Given the changes, disruptions, and stresses beget by the pandemic, evidence of increases in mental health problems⁴⁻⁷ and related service needs, including telepsychology, emerged during the pandemic.⁸⁻¹⁰ The mental health functioning of members of higher education communities, especially that of students, was of some particular interest.

At a broad level, being a young adult and a student were both found to be risk factors for mental distress during the pandemic,¹¹⁻¹³ and increases in mental health problems were observed among higher education students. Specifically, during the pandemic, college students reported more mood disorder symptoms, perceived stress and fear, alcohol and substance use, eating disorder behaviors, and comorbidity than pre-pandemic.¹⁴⁻¹⁷

Attention was also paid to other risk factors for increased mental health problems within this population,¹⁸⁻²¹ and some differential effects were observed across demographic groups.^{14,22-26} For instance, higher education students reported experiencing

additional stressors and risky coping strategies during the pandemic,²⁷⁻³⁰ including sudden shifts to online instruction, academic fears, problems concentrating, eating problems, difficulties with sleep, increased substance use, and reduced physical activity.³¹⁻³³

The present study launched within months of when COVID-19 was declared a public health emergency in the United States. The purpose of the study was to examine COVID-19-specific biopsychosocial stressors and behavioral health functioning among a sample of higher education sample students during the pandemic. Specifically, various stressors (e.g., worries, exposure, necessities, employment, social); well-being and adaptive coping; mental health and substance use symptoms; and maladaptive coping during the COVID-19 pandemic. Due to the pandemic-time context of the study, the investigation of rates of stressors and behavioral health issues reported by semester cohorts during the COVID-19 pandemic, from June 2020 to December 2021, were exploratory. Relationships between demographic factors and stressors, on the one hand, and behavioral health functioning, on the other, were also examined exploratorily. That is, the timing of data collection preceded the publication of many parallel primary studies and subsequent meta-analyses. The detailed foci of the present investigation, however, lends both complementary and novel data to the corpus of roughly similar studies conducted with higher education students at the peak of the COVID-19 pandemic in the United States.

Method

Procedures and Participants

The study proceeded following approval from a university institutional review board. Participants were recruited chiefly via an undergraduate student research pool maintained by the psychology department of a university located in the Mid-Atlantic Region of the United States ($n = 1,392$). Other participants were recruited via school and clinical psychology graduate student email lists maintained by the psychology department and an email listserv for one of the staff unions at the university ($n = 33$), or else were indeterminate ($n = 16$). Participants consented to complete an omnibus Internet survey, administered between June 2020 and December 2021. The sample was stratified into semester cohorts based on time of completion of the survey (see Table 1). Participants were permitted to skip questions, which resulted in inconsistent response totals across variables and that we addressed using a multiple imputation method. Low responsiveness to requests to complete follow-up surveys resulted in the *post hoc* decision to limit the study and analyses to cross-sectional baseline data ($N = 1,441$). Partially overlapping preliminary descriptive analyses for an earlier iteration of the current sample ($n = 925$) were previously reported.³⁴

Table 1: Sample Demographics

Variable	Missing <i>n</i>	<i>n</i> or Range	% or <i>M</i> (<i>SD</i>)
Demographics and semester cohort			
Age (in years)	25	18–65	19.8 (4.7)
Gender identity	1		
Man		308	21.4
Woman		1,106	76.8
Transgender		4	0.3
Non-binary		18	1.2
Other		4	0.3
Race/ethnicity	1		
White		550	38.2
African American or Black		191	13.3
Hispanic or Latinx		387	26.9
Asian		91	6.3
Native Hawaiian or Other Pacific Islander		1	0.1
American Indian or Alaska Native		1	0.1
Multiracial/multiethnic		191	13.3
Other		28	1.9
Semester cohort	0		
Spring and Summer 2020		89	6.2
Fall 2020		365	25.3
Winter 2020 and 2021		166	11.5
Spring 2021		266	18.5
Summer 2021		32	2.2
Fall 2021		523	36.3

Stress/worry index		3–12	8.1 (2.1)
Have you experienced stress related to the COVID-19 pandemic?	13		
Not at all		152	10.5
Yes, slight stress		521	36.2
Yes, moderate stress		475	33.0
Yes, significant stress		293	20.3
How worried are you that you will contract COVID-19?	9		
Not at all		185	12.8
Slightly		472	32.8
Moderately		540	37.5
Significantly		244	16.9
How worried are you about your future in light of the COVID-19 pandemic?	10		
Not at all		136	9.4
Slightly		314	21.8
Moderately		557	38.7
Significantly		435	30.2
Employment hardship item		1–3	1.4 (0.7)
Have you experienced personal job loss due to the COVID-19 pandemic?	71		
No		974	67.6
Yes, temporarily laid off		339	23.5
Yes, permanently laid off		128	8.9
Access to necessities item		1–4	1.5 (0.8)
How much difficulty have you had getting needed necessities (for example, food, shelter, or prescription medications) due to the COVID-19 pandemic?	11		
None		859	59.6
A little		408	28.3
A moderate amount		146	10.1
A lot		28	2.0
Exposure risk index		0–6	2.2 (1.5)
Are you an essential employee?	11		
Yes		346	24.0
No		1,095	76.0
Do you work in a position that puts you at increased risk for contact with people who have or may have COVID-19?	233		
Yes		578	40.0
No		863	60.0
Has a family member or anyone you know tested positive for COVID-19?	60		
Yes		1,024	71.0
No		417	29.0
Have you had close contact with an individual with confirmed COVID-19?	24		
Yes		558	14.5
No		883	61.3
Have you tested positive for COVID-19?	56		
Yes		265	18.4
No		1,176	81.6
Have any of your friends or family died due to COVID-19?	67		
Yes		380	26.4
No		1,061	73.6
Social isolation index		3–15	8.4 (2.1)
Has your contact with extended family members and friends changed since the COVID-19 pandemic began?	12		
Much less		185	12.8
Somewhat less		250	17.3
About the same		430	30.0
Somewhat more		302	21.0
Much more		274	19.0

Has the quality of your relationships with your friends changed since the COVID-19 pandemic began?	10		
Much worse		100	7.0
Somewhat worse		315	21.8
About the same		660	45.8
Somewhat better		257	17.8
Much better		109	7.5
Is your life more lonely because of the COVID-19 pandemic?	10		
Much more		352	24.4
Somewhat more		514	35.7
About the same		449	31.2
Somewhat less		73	5.1
Much less		52	3.6
Household conflict/violence index		2–6	5.1 (1.0)
Has there been a change in conflict among people in your household since the COVID-19 pandemic began?	446		
Much more		172	11.9
Somewhat more		541	37.6
About the same or less		728	50.5
Has there been a change in violence among people in your household since the COVID-19 pandemic began?	1,074		
Much more		33	2.3
Somewhat more		381	26.4
About the same or less		1,027	71.2
Discrimination index		0–2	0.4 (0.6)
Do you think people have treated you unfairly based on your age since the COVID-19 pandemic began?	12		
Yes		338	23.4
No		1,103	76.6
Do you think people have treated you unfairly based on your race or ethnicity since the COVID-19 pandemic began?	12		
Yes		227	15.8
No		1,214	84.2
Prior mental health index		0–2	0.5 (0.8)
Before the COVID-19 pandemic began, did you ever receive mental health services?	11		
Yes		346	24.0
No		1,095	76.0
Prior to the COVID-19 pandemic, were you formally diagnosed with a mental health condition?	2		
Yes		316	21.9
No		1,125	78.1
Dependent/criterion variables			
MHC-SF Total Score	64	0–70	37.0 (15.2)
Brief COPE Adaptive Subscale Score	75	16–64	36.1 (10.1)
PSS Total Score	18	2–40	21.8 (6.4)
PHQ-9 Total Score	29	0–27	9.6 (6.8)
GAD-7 Total Score	41	0–21	8.6 (6.0)
PC-PTSD-5 Total Score	20	0–5	1.8 (1.5)
AUDIT Total Score	18	0–37	2.3 (4.0)
DAST-10 Total Score	62	0–10	0.7 (1.5)
Brief COPE Maladaptive Subscale Score	52	12–48	22.2 (6.5)

Note. All values for *ad hoc* items and indexes, and dependent/criterion variables, are pooled estimates based on five imputations. Values in the *n* or *Range* column are rounded to whole numbers, and values in the % or *M (SD)* column are rounded to one decimal place, to improve readability. Values may therefore not add up to exactly *N* = 1,441, or 100%, across variable levels. An expanded version of this table is available by contacting the first author, which reflects additional sociodemographic information about the sample; pooled estimates based on five imputations; and demographic subgroup differences for all *ad hoc* items and indexes and dependent/criterion variables pursuant to chi-square tests, *t*-tests, and ANOVAs. MHC-SF = Mental Health Continuum Short Form; Brief COPE = Coping Orientation to Problems Experienced Inventory; PSS = Perceived Stress Scale; PHQ-9 = Patient Health Questionnaire-9; GAD-7 = General Anxiety Disorder-7; PC-PTSD-5 = Primary Care PTSD Screen for DSM-5; AUDIT = Alcohol Use Disorders Identification Test; DAST-10 = Drug Abuse Screening Test.

Measures

The survey consisted of both ad-hoc questions and previously validated self-report measures. The survey elicited responses about demographic factors and biopsychosocial experiences and functioning prior to and during the COVID-19 pandemic, in addition to responses to measures of perceived stress, behavioral health functioning, and coping strategies. Variables examined in the current report were demographic factors and semester, and biopsychosocial stressors experienced during the COVID-19 pandemic, including well-being; adaptive coping; perceived stress; depression, anxiety, and traumatic symptoms; alcohol and drug use symptomology; and maladaptive coping. Questions inquiring about similar conceptual matters were combined into indexes for analyses. Vague responses such as “other” or “unsure” were coded as indeterminate and excluded from analysis. Items and indexes were scored so that higher scores generally reflected higher levels of each positively or negatively valenced variable.

Demographics

Demographic variables were as follows: age, gender identity, race/ethnicity identity, sexual orientation, semester cohort during which the survey was completed, highest level of education, income status for oneself, income status for the neighborhood in which one lives, current living situation, employment status, and relationship status. Racial and ethnic identity were collapsed into a single multi-level variable, with some small subgroups being collapsed into a single Other variable level for statistical purposes. Similarly, the small gender identity subgroups of transgender and non-binary were collapsed into an Other variable level. Descriptive statistics for the three demographic variables that we included in multivariable models (age, gender identity, and collapsed race and ethnicity) are provided in Table 1. The proportion of women in our sample (77%) was moderately higher than the rate of women among undergraduate students at the university where the study was conducted, but more closely corresponded with the proportion of psychology majors who identify as women at the university. The racial and ethnic identity breakdown of our sample generally corresponded with that of the overall undergraduate student body at the university.

Biopsychosocial Stressors

Validated measures of the range of biopsychosocial stressors we sought to measure in specific connection to the COVID-19 pandemic would not have been available when the study began, and the use of more general validated measures would have required altering instructions or item content (e.g., concerning timeframe) for cross-sectional measurement consistent with our aims. Accordingly, we

proceeded with the use of ad-hoc questions regarding biopsychosocial stressors experienced prior to and during the COVID-19 pandemic, with dichotomous or Likert-type response options.

A *stress/worry index* consisted of participant responses to three items about one’s level of stress due to the pandemic, worry about contracting COVID-19, and worry about the future in light of the pandemic. An *employment hardship item* read, *Have you experienced personal job loss due to the COVID-19 pandemic?* An *access to necessities item* read, *How much difficulty have you had getting needed necessities (for example, food, shelter, or prescription medications) due to the COVID-19 pandemic?* An *exposure risk index* consisted of six dichotomous items examining a participant’s risk of contracting COVID-19 through their social network, including essential employment or close contact with friends and family. A *social isolation index* consisted of three items concerning feelings of loneliness and changes in relationships due to the COVID-19 pandemic. A *household conflict/violence index* consisted of two questions concerning changes in conflict or violence in the home during the pandemic. A *discrimination index* consisted of two dichotomous questions, which examined feelings experienced since the COVID-19 pandemic began around unfair treatment based on age and race/ethnicity. Lastly, a *prior mental health index* consisted of two dichotomous questions, which asked participants about whether they had received a mental health diagnosis or services prior to the pandemic.

Well-Being

Well-being was measured using the *Mental Health Continuum Short Form MHC-SF*,³⁵ which consists of 14 items focused on past-month aspects of well-being (emotional, psychological, and social). Responses use a 6-point Likert-type scale and are summed to yield a total score ranging from 0 to 70. The MHC-SF has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and structural).³⁵⁻³⁶ The Cronbach’s alpha (α) in the current sample was 0.94.

Coping (Adaptive and Maladaptive)

The Brief Coping Orientation to Problems Experienced Inventory (Brief COPE)³⁷ was used to measure both adaptive and maladaptive coping. Participants were focused on their coping in response to the COVID-19 pandemic via an accompanying instruction. The measure consists of 28 items responded to using a 4-point Likert-type scale, yielding 14 two-item subscales that can be further aggregated into additional subscales. We utilized the aggregate coping and maladaptive coping subscales,³⁸ where subscales 1–8 constitute adaptive coping and subscales 9–14 maladaptive coping. The Brief COPE has

previously demonstrated adequate reliability (e.g., internal consistency) and validity (e.g., structural);³⁹ the longer measure from which it was derived has also demonstrated adequate reliability (e.g., retest) and validity (e.g., convergent and divergent).³⁷ The α s for the adaptive and maladaptive subscales in the current sample were 0.90 and 0.85, respectively.

Perceived Stress

Perceived stress was measured using the Perceived Stress Scale (PSS).⁴⁰ It consists of 10 items answered using a 5-point Likert-type scale to indicate the frequency that different perceived stressors have been experienced in the last month. Item responses are aggregated into a total score. The PSS has previously demonstrated adequate reliability (e.g., internal consistency and retest)⁴¹ and validity (e.g., convergent and predictive).⁴²⁻⁴³ The α in the current sample was 0.85.

Depression

The Patient Health Questionnaire-9 (PHQ-9)⁴⁴ was used to measure depressive symptomology. It measures nine depression symptoms experienced over the past two weeks, responded to using a four-point Likert-type scale. Responses summed to yield a total score ranging from 0 to 27. A widely used measure, the PHQ-9 has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and predictive).⁴⁴⁻⁴⁵ The α was 0.91 in the current sample.

Anxiety

Anxiety symptomology within the past two weeks was measured using the Generalized Anxiety Disorder-7 (GAD-7).⁴⁶ Respondents rate seven items concerning the frequency of anxiety symptoms using a four-point Likert-type scale. These responses are summed to yield a total score. The widely used GAD-7 has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and predictive).⁴⁶⁻⁴⁷ The α in the current sample was 0.93.

Traumatic Symptomology

The Primary Care Post Traumatic Stress Disorder Screen for DSM-V (PC-PTSD-5)⁴⁸ was used to measure traumatic symptomology. The measure consists of five dichotomous items concerning traumatic symptoms experienced in the last month. Items were reworded to focus specifically on the COVID-19 pandemic (e.g., *In the past month, have you tried hard not to think about the COVID-19 pandemic or went out of your way to avoid situations that reminded you of the COVID-19 pandemic?*). Yes responses are summed to yield a total score. The PC-PTSD-5 has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and validity).⁴⁹⁻⁵¹ The α was 0.69 in the current sample.

Alcohol Use

Alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT).⁵² The measure consists of 10 items that ask respondents to rate the frequency of behaviors or experiences related to alcohol consumption using different Likert-type scales. Responses are summed to yield a total score ranging from 0 to 40. The AUDIT has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and predictive).⁵³⁻⁵⁶ The α in the current sample was 0.84.

Drug Use

The Drug Abuse Screening Test (DAST-10)⁵⁷ was used to measure drug use. Respondents rate 10 dichotomous items concerning drug use behaviors or experiences in the past 12 months. Each Yes response is summed to yield a total score ranging from 0 to 10. The DAST-10 has previously demonstrated adequate reliability (e.g., internal consistency and retest) and validity (e.g., convergent and predictive).^{56,58} The α was 0.82 in the current sample.

Data Analysis

Multiple Imputation

Response rates varied across variables since participants could skip survey items to which they did not wish to respond (*Range* = 0–1,074, *M* = 64.9, *SD* = 181.0; with removal of one outlier household violence item, *Range* = 0–446, *M* = 39.1, *SD* = 78.3). A preliminary analysis was conducted to analyze for patterns in missing data. The analysis did not evidence that missing data exhibited a monotone pattern (i.e., when reorganized, the data did suggest that a participant missing a value was also missing all values to the right of that variable, and that a participant with an observed value also had observed values for all variables to the left of the variable's position). Accordingly, multiple imputation was conducted to estimate missing values using the iterative Markov Chain Monte Carlo (MCMC) method.

Missing values were imputed for all independent variables except demographic variables, and all dependent variables. The imputed values were restricted to fall within the ranges of the observed values. Additionally, imputed values were rounded to the nearest whole integer to simulate existing response options. Five imputations were conducted, with the pooled results reported in Tables 1 through 11. For indexes, individual items were imputed and then aggregated.

As missing values were not imputed for demographic predictors (age, gender identity, and race/ethnicity) included in multivariable analysis, 25 participants were removed from the analyses via list-wise deletion (i.e., a

reduction of the N from 1,441 to 1,416). Pursuant to a *post hoc* power analysis, this final sample size was sufficient for the most demanding analysis, multiple regression. Power was $> .99$ for both moderate ($f^2 = .15$) and large effect size conventions ($f^2 = .35$).

Bivariable and Multivariable Analyses

Analysis of variance (ANOVA) and chi-square analyses were used to examine omnibus demographic differences across independent and dependent variables. Because these analyses were secondary, we did not examine post-hoc contrasts. We next used correlation coefficients (Spearman's ρ , ρ) to examine bivariable relationships between semester cohort and biopsychosocial stressors, on the one hand, and measures of behavioral health functioning, on the other. To examine multivariable effects, nine regression analyses were conducted. The predictor variables were demographic factors (age, gender identity, race/ethnicity); semester cohort; and biopsychosocial stressor indexes and items. The gender identity, race/ethnicity, and semester cohort variables were also dummy coded, with the reference group being 0 = *Man*, 0 = *White/Caucasian*, and 0 = *Spring and Summer 2020*, respectively. The dependent/criterion variables were the total scores for well-being (MHC-SF); adaptive coping (adaptive subscale of COPE); perceived stress (PSS); depression (PHQ-9); anxiety (GAD-7); traumatic symptomology (PC-PTSD-5); alcohol use (AUDIT), drug use (DAST-10); and maladaptive coping (maladaptive subscale of Brief COPE).

The AUDIT and DAST-10 did not pass assumption checks for normality and heteroscedasticity for multiple linear regression (whereas the other criterion variables satisfied statistical assumptions for this procedure). The data could not be corrected using transformation methods (such as the Box-Cox method) and continued to evidence heteroscedasticity when the weighted least squares method was used. Therefore, logistic regression was used for the AUDIT and DAST-10, following dichotomization of the total scores for each measure. In dichotomizing these two outcome variables, we sought to balance maximization of the severity reflected by the higher variable level (as per the categorical severity levels provided by developers of the respective measures) while also being mindful of the need to maintain a sufficient subsample size for the higher dichotomous variable level. Thus, the AUDIT was dichotomized such that individuals who received a total score of 8 or higher (which includes the moderate and severe risk categories) were coded as 1 (higher severity) and individuals who received a total score of 7 or lower coded as 0 (lower severity). The DAST, in turn, was dichotomized such that individuals who received a total score of 3 or higher (which includes the moderate, substantial, and severe risk categories) were coded as

1 (higher severity) and individuals who received a total score of 2 or lower were coded as 0 (lower severity).

Given the number of analyses that we conducted, to minimize risk of Type I error, a Bonferroni correction was employed. Specifically, $p < .05$ value was divided by 9, the number of regression analyses conducted, such that $p < .006$ was used for interpreting significant effects.

Results

Descriptive Results

An expanded version of Table 1 with descriptive information for all study variables (beyond select demographic variables, the semester cohort variable, and the remaining variables included in the multivariable models) is available by contacting the first author. Regarding independent variables, a majority of participants experienced moderate or higher stress/worries (53–69% for individual items contributing to this index). A minority experienced employment hardship (32%) or at least moderate difficulty accessing necessities (12%). Percentages varied widely for COVID-19 exposure risk items (15–71%). At least somewhat decreased social network contact (30%) or quality (29%) was experienced by a minority of the sample; whereas at least somewhat increased feelings of loneliness were observed for a majority (60%). Half of the sample experienced at least somewhat of an increase in conflict at home (50%), and about a fourth (29%) experienced at least somewhat of an increase in household violence. About a quarter of the sample experienced discrimination (23%). Finally, about a quarter of the sample received a mental health diagnosis (22%) or services (24%) prior to the pandemic.

Regarding dependent variables, participants, on average, reported well-being and adaptive coping toward the mid-point of those respective measures. They also reported perceived stress and maladaptive coping toward the mid-point of the respective measures of these constructs. Average scores for depression, anxiety, and traumatic symptomology—especially alcohol and drug use—were toward the lower end of the potential scores for measures of these constructs.

Correlational Results

Correlational results are provided in Table 2. Most independent variables evidenced bivariable relationships with the dependent variables. However, linear relationships between progressing semesters and the outcomes were generally not observed, except for a small negative association with trauma symptomology (i.e., a small decrease in trauma symptoms over time). The independent variables with the most consistently sizable patterns of associations were the stress/worry index, social isolation index, household conflict/violence

Table 2: Correlations Between Independent and Dependent Variables

Variable	W-B	+ C	PS	Dep	Anx	Trauma	ETOH	Drug	- C
Semester	-.01	-.03	-.003	-.001	-.01	-.08**	-.01	-.01	-.04
Stress/worry index	-.25***	.22***	.40***	.37***	.44***	.48***	.05	.07*	.37***
Employment hardship item	-.06*	.05	.07**	.08**	.07**	.11***	.10***	.04	.10***
Access to necessities item	-.13***	.09***	.13***	.18***	.16***	.19***	.04	.03	.16***
Exposure risk index	-.03	.04	.09***	.10***	.12***	.10***	.19***	.11***	.09***
Social isolation index	-.24***	.04	.22***	.24***	.20***	.17***	.04	.05	.16***
Household conflict/violence index	-.13***	.12**	.20***	.18***	.20***	.20***	.05	.07*	.20***
Discrimination index	-.12***	.10***	.17***	.19***	.18***	.20***	.05	.06*	.18***
Prior mental health index	-.17***	.19***	.20***	.26***	.29***	.21***	.11***	.15***	.25***

Note. N = 1,441. W-B = well-being; + C = adaptive coping; PS = perceived stress; Dep = depression symptoms; Anx = anxiety symptoms; Trauma = trauma symptoms; ETOH = alcohol use symptoms; Drug = drug use symptoms; - C = maladaptive coping.
* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 3: Multiple Regression Model Predicting Well-Being (MHC-SF)

Variable	b	SE of b	β	t	p	95% CI for b
Constant	70.78	3.44		20.60	< .001	[64.04, 77.51]
Age	0.15	0.08	0.05	1.91	.06	[0.00, 0.31]
Gender identity (Reference = Man)						
Woman	-2.79	0.95	-0.08	-2.93	.003	[-4.66, -0.93]
Other	-3.18	3.07	-0.03	-1.03	.30	[-9.21, 2.86]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	-4.52	1.23	-0.10	-3.69	< .001	[-6.92, -2.12]
Hispanic or Latinx	-4.54	0.98	-0.13	-4.63	< .001	[-6.47, -2.62]
Asian	-3.18	1.62	-0.05	-1.97	.05	[-6.35, -0.02]
Multiracial/multiethnic	-3.59	1.18	-0.08	-3.03	.002	[-5.91, -1.27]
Other	-6.75	2.63	-0.06	-2.57	.01	[-11.90, -1.61]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	-1.04	1.68	-0.03	-0.62	.54	[-4.32, 2.26]
Winter 2020–2021	2.93	1.92	0.06	1.53	.13	[-0.84, 6.70]
Spring 2021	-1.74	1.81	-0.04	-0.96	.34	[-5.30, 1.81]
Summer 2021	1.87	2.95	0.02	0.63	.53	[-3.91, 7.65]
Fall 2021	-2.23	1.69	-0.07	-1.32	.19	[-5.54, 1.08]
Stress/worry index	-1.13	0.20	-0.16	-5.71	< .001	[-1.51, -0.74]
Employment hardship item	-0.60	0.61	-0.03	-0.97	.33	[-1.80, 0.61]
Access to necessities item	-1.19	0.54	-0.06	-2.22	.03	[-2.25, -0.14]
Exposure risk index	0.08	0.27	0.01	0.31	.76	[-0.45, 0.62]
Social isolation index	-1.65	0.18	-0.23	-9.10	< .001	[-2.01, -1.30]
Household conflict/violence index	-0.52	0.50	-0.03	-1.04	.31	[-1.54, 0.50]
Discrimination index	-1.51	0.66	-0.06	-2.29	.02	[-2.81, -0.21]
Prior mental health index	-2.96	0.52	-0.15	-5.71	< .001	[-3.97, -1.94]

Note. N = 1,416. MHC-SF = Mental Health Continuum Short Form.

index, discrimination index, and prior mental health index. All these effects were in the expected directions. The dependent variables that evidenced the weakest relationships across all independent variables (mean | ρ |) were drug (.07) and alcohol use (.08), followed by adaptive coping (.10) and well-being (.13).

Multivariable Results

Multiple or logistic regression were used to examine whether semester cohort, select demographic factors, and biopsychosocial indexes predicted the different dependent variables (Tables 3–11).

Well-Being and Adaptive Coping

The multiple regression model for well-being (Table 3) was statistically significant overall, $R^2 = .18$, $F(21, 1394) = 14.69$, $p < .001$. Significant predictors were identifying as a woman; Black or African American, Hispanic or Latinx, and multiracial/multiethnic; and the stress/worry, social isolation, and prior mental health indexes. The omnibus multiple regression model for adaptive coping (Table 4) was also significant, $R^2 = .10$, $F(21, 1394) = 7.40$, $p < .001$. Only the stress/worry and the prior mental health indexes were significant predictors of adaptive coping scores.

Table 4: Multiple Regression Model Predicting Adaptive Coping (Brief COPE Adaptive Subscale)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	25.62	2.62		9.78	< .001	[20.43, 30.82]
Age	0.04	0.06	0.02	0.69	.49	[-0.07, 0.15]
Gender identity (Reference = Man)						
Woman	0.83	0.66	0.03	1.26	.21	[-0.46, 2.12]
Other	0.76	2.09	0.01	0.37	.72	[-3.33, 4.85]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	1.47	0.87	0.05	1.70	.09	[-0.23, 3.18]
Hispanic or Latinx	-1.04	0.67	-0.05	-1.55	.12	[-2.35, 0.28]
Asian	-2.38	1.16	-0.06	-2.05	.04	[-4.65, -0.10]
Multiracial/multiethnic	0.5	0.86	0.02	0.58	.56	[-1.19, 2.18]
Other	-0.08	1.91	0.00	-0.04	.97	[-3.83, 3.67]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	-2.27	1.35	-0.10	-1.68	.10	[-4.98, 0.44]
Winter 2020–2021	-2.33	1.46	-0.07	-1.59	.12	[-5.23, 0.58]
Spring 2021	-1.75	1.45	-0.07	-1.21	.23	[-4.68, 1.18]
Summer 2021	0.6	2.19	0.01	0.28	.78	[-3.73, 4.93]
Fall 2021	-2.11	1.33	-0.10	-1.58	.12	[-4.78, 0.57]
Stress/worry index	0.86	0.14	0.18	6.36	< .001	[0.59, 1.12]
Employment hardship item	0.25	0.42	0.02	0.59	.56	[-0.58, 1.08]
Access to necessities item	0.38	0.36	0.03	1.05	.29	[-0.33, 1.09]
Exposure risk index	0.11	0.18	0.02	0.57	.57	[-0.26, 0.47]
Social isolation index	-0.01	0.13	0.00	-0.07	.94	[-0.26, 0.24]
Household conflict/violence index	0.66	0.34	0.07	1.94	.06	[-0.03, 1.35]
Discrimination index	0.79	0.46	0.05	1.71	.09	[-0.12, 1.70]
Prior mental health index	1.92	0.38	0.15	5.13	< .001	[1.18, 2.66]

Note. *N* = 1,416. Brief COPE = Coping Orientation to Problems Experienced Inventory.

Table 5: Multiple Regression Model Predicting Perceived Stress (PSS)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	6.06	1.33		4.56	< .001	[16.21, 22.85]
Age	-0.12	0.03	-0.09	-3.89	< .001	[-0.18, -0.06]
Gender identity (Reference = Man)						
Woman	2.03	0.37	0.13	5.46	< .001	[1.31, 2.76]
Other	3.40	1.16	0.07	2.93	.003	[1.12, 5.67]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	1.15	0.48	0.06	2.39	.02	[0.21, 2.09]
Hispanic or Latinx	0.32	0.38	0.02	0.86	.39	[-0.41, 1.06]
Asian	-0.27	0.64	-0.01	-0.42	.68	[-1.52, 0.98]
Multiracial/multiethnic	0.50	0.47	0.03	1.07	.28	[-0.42, 1.42]
Other	0.24	1.05	0.01	0.22	.82	[-1.82, 2.29]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	0.03	0.66	0.00	0.05	.96	[-1.26, 1.32]
Winter 2020–2021	-1.59	0.73	-0.08	-2.16	.03	[-3.02, -0.15]
Spring 2021	0.19	0.69	0.01	0.27	.79	[-1.16, 1.53]
Summer 2021	-1.79	1.17	-0.04	-1.53	.13	[-4.09, 0.51]
Fall 2021	0.58	0.64	0.04	0.91	.37	[-0.68, 1.84]
Stress/worry index	0.89	0.08	0.29	11.67	< .001	[0.74, 1.04]
Employment hardship item	0.27	0.26	0.03	1.07	.29	[-0.24, 0.78]
Access to necessities item	0.49	0.20	0.06	2.41	.02	[0.09, 0.89]
Exposure risk index	0.16	0.11	0.04	1.51	.13	[-0.05, 0.37]
Social isolation index	0.53	0.07	0.18	7.51	< .001	[0.39, 0.67]
Household conflict/violence index	0.48	0.18	0.08	2.72	.01	[0.13, 0.84]
Discrimination index	0.99	0.25	0.09	3.92	< .001	[0.49, 1.48]
Prior mental health index	1.33	0.20	0.16	6.52	< .001	[0.93, 1.72]

Note. *N* = 1,416. PSS = Perceived Stress Scale.

Table 6: Multiple Regression Model Predicting Depression (PHQ-9)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	-7.31	1.43		-5.12	< .001	[-10.11, -4.51]
Age	-0.09	0.03	-0.07	-2.84	.005	[-0.16, -0.03]
Gender identity (Reference = Man)						
Woman	1.54	0.40	0.10	3.88	< .001	[0.76, 2.32]
Other	4.03	1.24	0.08	3.26	.001	[1.61, 6.46]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	1.39	0.52	0.07	2.67	.01	[0.37, 2.42]
Hispanic or Latinx	0.61	0.40	0.04	1.51	.13	[-0.18, 1.40]
Asian	0.26	0.68	0.01	0.39	.70	[-1.07, 1.59]
Multiracial/multiethnic	0.74	0.50	0.04	1.48	.14	[-0.24, 1.71]
Other	1.28	1.13	0.03	1.14	.25	[-0.92, 3.49]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	0.45	0.72	0.03	0.63	.53	[-0.96, 1.86]
Winter 2020–2021	-1.50	0.80	-0.07	-1.87	.06	[-3.06, 0.07]
Spring 2021	0.64	0.75	0.04	0.85	.40	[-0.84, 2.12]
Summer 2021	0.18	1.23	0.00	0.15	.88	[-2.24, 2.60]
Fall 2021	0.79	0.71	0.06	1.10	.27	[-0.62, 2.19]
Stress/worry index	0.83	0.08	0.26	10.25	< .001	[0.67, 0.99]
Employment hardship item	0.17	0.25	0.02	0.68	.50	[-0.32, 0.66]
Access to necessities item	0.78	0.22	0.09	3.59	< .001	[0.35, 1.20]
Exposure risk index	0.22	0.12	0.05	1.85	.07	[-0.01, 0.45]
Social isolation index	0.59	0.08	0.18	7.71	< .001	[0.44, 0.73]
Household conflict/violence index	0.38	0.17	0.06	2.20	.03	[-.04, 0.71]
Discrimination index	1.20	0.27	0.11	4.45	< .001	[0.67, 1.72]
Prior mental health index	1.95	0.21	0.22	9.09	< .001	[1.53, 2.36]

Note. *N* = 1,416. PHQ-9 = Patient Health Questionnaire-9.

Table 7: Multiple Regression Model Predicting Anxiety (GAD-7)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	-5.77	1.24		-4.65	< .001	[-8.20, -3.34]
Age	-0.08	0.03	-0.06	-2.75	.01	[-0.14, -0.02]
Gender identity (Reference = Man)						
Woman	1.26	0.35	0.09	3.65	< .001	[0.58, 1.94]
Other	2.03	1.09	0.05	1.86	.06	[-0.11, 4.18]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	0.02	0.45	0.00	0.05	.96	[-0.85, 0.90]
Hispanic or Latinx	-0.53	0.35	-0.04	-1.54	.13	[-1.21, 0.15]
Asian	-0.85	0.59	-0.03	-1.46	.15	[-2.00, 0.30]
Multiracial/multiethnic	0.02	0.43	0.00	0.05	.96	[-0.82, 0.86]
Other	-1.08	0.96	-0.03	-1.12	.26	[-2.96, 0.80]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	-0.44	0.61	-0.03	-0.73	.47	[-1.64, 0.75]
Winter 2020–2021	-1.05	0.68	-0.06	-1.54	.12	[-2.37, 0.28]
Spring 2021	-0.18	0.64	-0.01	-0.28	.78	[-1.44, 1.08]
Summer 2021	-0.22	1.09	-0.01	-0.20	.84	[-2.36, 1.93]
Fall 2021	0.47	0.60	0.04	0.79	.43	[-0.70, 1.63]
Stress/worry index	1.01	0.07	0.35	14.39	< .001	[0.87, 1.14]
Employment hardship item	0.11	0.22	0.01	0.50	.62	[-0.32, 0.54]
Access to necessities item	0.36	0.19	0.05	1.90	.06	[-0.01, 0.73]
Exposure risk index	0.27	0.10	0.07	2.75	.01	[0.08, 0.46]
Social isolation index	0.34	0.07	0.12	5.14	< .001	[0.21, 0.46]
Household conflict/violence index	0.47	0.15	0.08	3.10	<.001	[0.17, 0.76]
Discrimination index	0.87	0.23	0.09	3.71	< .001	[0.41, 1.32]
Prior mental health index	1.80	0.19	0.23	9.45	< .001	[1.43, 2.17]

Note. *N* = 1,416. GAD-7 = General Anxiety Disorder-7.

Table 8: Multiple Regression Model Predicting Posttraumatic Stress (PC-PTSD-5)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	-1.56	0.32		-4.93	< .001	[-2.19, -0.94]
Age	-0.02	0.01	-0.07	-2.94	.003	[-0.04, -0.01]
Gender identity (Reference = Man)						
Woman	0.21	0.09	0.06	2.42	.02	[0.04, 0.38]
Other	0.44	0.27	0.04	1.60	.11	[-0.10, 0.97]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	-0.04	0.11	-0.01	-0.35	.73	[-0.26, 0.18]
Hispanic or Latinx	-0.05	0.09	-0.01	-0.54	.59	[-0.22, 0.13]
Asian	-0.27	0.15	-0.04	-1.77	.08	[-0.56, 0.03]
Multiracial/multiethnic	-0.02	0.11	-0.01	-0.21	.84	[-0.24, 0.19]
Other	-0.21	0.25	-0.02	-0.85	.39	[-0.69, 0.27]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	-0.31	0.16	-0.09	-1.97	.05	[-0.62, 0.00]
Winter 2020–2021	-0.39	0.18	-0.08	-2.21	.03	[-0.73, -0.04]
Spring 2021	-0.27	0.16	-0.07	-1.65	.10	[-0.59, 0.05]
Summer 2021	-0.23	0.27	-0.02	-0.84	.40	[-0.76, 0.30]
Fall 2021	-0.27	0.15	-0.08	-1.75	.08	[-0.57, 0.03]
Stress/worry index	0.29	0.02	0.40	16.22	< .001	[0.25, 0.32]
Employment hardship item	0.12	0.06	0.05	2.24	.03	[0.02, 0.23]
Access to necessities item	0.16	0.05	0.08	3.39	< .001	[0.07, 0.26]
Exposure risk index	0.05	0.02	0.05	2.13	.03	[0.00, 0.10]
Social isolation index	0.06	0.02	0.08	3.36	< .001	[0.02, 0.09]
Household conflict/violence index	0.08	0.04	0.05	2.08	.04	[0.00, 0.16]
Discrimination index	0.28	0.06	0.11	4.67	< .001	[0.16, 0.39]
Prior mental health index	0.29	0.05	0.14	6.11	< .001	[0.20, 0.38]

Note. *N* = 1,416. PC-PTSD-5 = Primary Care PTSD Screen for DSM-5.

Table 9: Logistic Regression Model Predicting Alcohol Use (AUDIT)

Variable	β	<i>SE of β</i>	Wald χ^2	<i>p</i>	<i>OR</i>	95% CI for <i>OR</i>
Constant	-2.49	0.90	8.15	.006	0.08	[0.14, 0.48]
Age	-0.01	0.02	0.76	.38	0.99	[0.96, 1.02]
Gender identity (Reference = Man)						
Woman	-0.53	0.24	5.01	.03	0.59	[0.37, 0.94]
Other	-1.26	1.08	1.36	.24	0.29	[0.03, 2.36]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	0.16	0.32	0.30	.61	1.18	[0.63, 2.18]
Hispanic or Latinx	-0.54	0.27	4.05	.05	0.58	[0.34, 0.99]
Asian	-0.17	0.47	0.14	.71	0.84	[0.34, 2.10]
Multiracial/multiethnic	-0.70	0.37	3.66	.06	0.50	[0.24, 1.03]
Other	0.16	0.69	0.13	.82	1.17	[0.30, 4.54]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	0.19	0.51	0.19	.71	1.21	[0.44, 3.32]
Winter 2020–2021	-0.59	0.62	1.04	.34	0.55	[0.16, 1.87]
Spring 2021	-0.10	0.53	0.08	.86	0.91	[0.32, 2.58]
Summer 2021	0.17	0.73	0.08	.82	1.18	[0.28, 4.97]
Fall 2021	0.10	0.50	0.09	.84	1.11	[0.41, 2.98]
Stress/worry index	-0.04	0.05	0.51	.49	0.96	[0.87, 1.07]
Employment hardship item	0.23	0.15	2.30	.14	1.26	[0.93, 1.70]
Access to necessities item	0.34	0.13	7.38	.01	1.41	[1.09, 1.81]
Exposure risk index	0.37	0.07	27.81	< .001	1.45	[1.26, 1.67]
Social isolation index	-0.05	0.05	1.09	.30	0.95	[0.86, 1.05]
Household conflict/violence index	-0.20	0.13	3.34	.15	0.82	[0.63, 1.08]
Discrimination index	0.28	0.16	2.96	.09	1.32	[0.96, 1.83]
Prior mental health index	0.56	0.13	20.38	< .001	1.75	[1.37, 2.23]

Note. *N* = 1,416. AUDIT = Alcohol Use Disorders Identification Test.

Table 10: Logistic Regression Model Predicting Drug Use (DAST-10)

Variable	β	SE of β	Wald χ^2	<i>p</i>	OR	95% CI for OR
Constant	-4.03	0.86	22.22	< .001	0.02	[0.00, 0.10]
Age	-0.02	0.02	1.01	.32	0.99	[0.96, 1.02]
Gender identity (Reference = Man)						
Woman	-1.04	0.22	21.80	< .001	0.36	[0.23, 0.55]
Other	0.29	0.52	0.33	.59	1.33	[0.48, 3.72]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	-0.05	0.38	0.08	.89	0.95	[0.45, 1.98]
Hispanic or Latinx	0.11	0.26	0.20	.67	1.12	[0.67, 1.86]
Asian	0.57	0.39	2.24	.15	1.77	[0.82, 3.81]
Multiracial/multiethnic	0.29	0.31	1.04	.34	1.34	[0.73, 2.46]
Other	0.03	0.80	0.12	.97	1.03	[0.21, 5.00]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	0.45	0.48	0.93	.35	1.57	[0.61, 4.04]
Winter 2020–2021	-0.28	0.61	0.30	.65	0.76	[0.23, 2.51]
Spring 2021	0.09	0.51	0.04	.87	1.09	[0.40, 2.95]
Summer 2021	0.79	0.70	1.39	.26	2.20	[0.56, 8.66]
Fall 2021	0.29	0.48	0.40	.55	1.33	[0.52, 3.43]
Stress/worry index	0.02	0.05	0.21	.69	1.02	[0.92, 1.13]
Employment hardship item	0.21	0.16	2.31	.20	1.24	[0.89, 1.71]
Access to necessities item	0.06	0.13	0.22	.68	1.06	[0.81, 1.37]
Exposure risk index	0.24	0.07	12.10	.001	1.27	[1.10, 1.46]
Social isolation index	0.05	0.05	1.05	.31	1.05	[0.96, 1.15]
Household conflict/violence index	0.12	0.11	1.63	.30	1.13	[0.90, 1.41]
Discrimination index	0.21	0.16	1.85	.19	1.24	[0.90, 1.69]
Prior mental health index	0.52	0.12	18.97	< .001	1.68	[1.32, 2.13]

Note. *N* = 1,416. DAST-10 = Drug Abuse Screening Test.

Perceived Stress

The multiple regression model for perceived stress (Table 5) was overall statistically significant, $R^2 = .29$, $F(21, 1394) = 27.12$, $p < .001$. Significant predictors were age; identifying as a woman or other gender identity; and the stress/worry, social isolation, discrimination, and prior mental health indexes.

Depression, Anxiety, and Traumatic Symptomology

The omnibus multiple regression models statistically significantly predicted depression (Table 6), $R^2 = .29$, $F(21, 1394) = 26.66$, $p < .001$; anxiety (Table 7), $R^2 = .32$, $F(21, 1394) = 31.26$, $p < .001$; and traumatic symptomology (Table 8), $R^2 = .31$, $F(21, 1394) = 30.01$, $p < .001$, respectively. Among the demographic predictors, age significantly predicted depression and traumatic symptomology. Woman gender identity predicted depression and anxiety symptoms. Gender identities other than man or woman also predicted depression symptoms. As for the biopsychosocial stressors predictors, all three outcomes (depression, anxiety, and traumatic symptomology, respectively) were predicted (all $ps < .001$) by the stress/worry, social isolation, discrimination, and prior mental health indexes. The access to necessities item predicted depression and traumatic symptomology, whereas the household conflict/violence index predicted anxiety symptoms.

Substance Use and Maladaptive Coping

The omnibus logistic regression models significantly predicted both alcohol use (Table 9), $\chi^2(21) = 82.46$, $p < .001$, Cox and Snell $R^2 = .06$, Nagelkerke $R^2 = .13$, correct classification rate = 92%; and drug use concerns (Table 10), $\chi^2(21) = 85.75$, $p < .001$, Cox and Snell $R^2 = .06$, Nagelkerke $R^2 = .13$, correct classification rate = 91%. Both outcomes (alcohol and drug use concerns, respectively) were significantly predicted by the exposure risk and prior mental health indexes. Woman gender identity predicted only drug use concerns.

The omnibus multiple regression model for maladaptive coping (Table 11) was also significant, $R^2 = .23$, $F(21, 1394) = 19.39$, $p < .001$. This was the only outcome significantly predicted by a term (Winter 2020–2021) contrasted with the collapsed terms first notably impacted by the pandemic (Spring and Summer 2020). The other significant predictors of this outcome were the stress/worry index, access to necessities item, social isolation index, discrimination index, and prior mental health index.

Discussion

We estimated many in our sample to have experienced a range of biopsychosocial stressors during the COVID-19 pandemic, consistent with findings by an ever-increasing

Table 11: Multiple Regression Model Predicting Maladaptive Coping (Brief COPE Maladaptive Subscale)

Variable	<i>b</i>	<i>SE of b</i>	β	<i>t</i>	<i>p</i>	95% CI for <i>b</i>
Constant	10.61	1.44		7.38	< .001	[7.79, 13.43]
Age	-0.08	0.03	-0.06	-2.51	.012	[-0.15, -0.02]
Gender identity (Reference = Man)						
Woman	0.39	0.40	0.03	0.98	.33	[-0.39, 1.18]
Other	1.07	1.35	0.02	0.80	.43	[-1.59, 3.74]
Race/ethnicity (Reference = White/Caucasian)						
African American or Black	0.86	0.52	0.04	1.66	.10	[-0.15, 1.87]
Hispanic or Latinx	-0.77	0.40	-0.05	-1.92	.06	[-1.56, 0.02]
Asian	-1.21	0.68	-0.05	-1.79	.07	[-2.53, 0.11]
Multiracial/multiethnic	0.07	0.50	0.00	0.15	.88	[-0.90, 1.05]
Other	-0.95	1.17	-0.02	-0.81	.42	[-3.25, 1.35]
Cohort (Reference = Spring–Summer 2020)						
Fall 2020	-1.22	0.75	-0.08	-1.64	.10	[-2.69, 0.24]
Winter 2020–2021	-2.25	0.80	-0.11	-2.81	.005	[-3.83, -0.68]
Spring 2021	-1.21	0.77	-0.07	-1.57	.12	[-2.71, 0.30]
Summer 2021	-1.57	1.26	-0.04	-1.24	.22	[-4.05, 0.91]
Fall 2021	-0.79	0.73	-0.06	-1.09	.28	[-2.23, 0.65]
Stress/worry index	0.84	0.08	0.27	10.37	< .001	[0.68, 0.99]
Employment hardship item	0.45	0.25	0.05	1.85	.06	[-0.03, 0.93]
Access to necessities item	0.70	0.22	0.08	3.17	.002	[0.27, 1.14]
Exposure risk index	0.19	0.12	0.04	1.62	.11	[-0.04, 0.42]
Social isolation index	0.28	0.08	0.09	3.58	< .001	[0.13, 0.43]
Household conflict/violence index	0.53	0.20	0.08	2.67	.01	[0.13, 0.93]
Discrimination index	1.02	0.27	0.10	3.75	< .001	[0.49, 1.55]
Prior mental health index	1.57	0.21	0.18	7.37	< .001	[1.15, 1.99]

Note. *N* = 1,416. Brief COPE = Coping Orientation to Problems Experienced Inventory.

number of others. This was especially the case for stress and worries, for which a majority of the sample experienced at least moderate increases, comparable to prior findings.^{19,23,32} However, rates for either experiencing, or experiencing a noteworthy increase in, the other stressors that we examined—employment hardship, challenges accessing necessities, risk of exposure to COVID-19, social isolation, household conflict and violence, discrimination, and prior mental health challenges—were sizable, even if experienced by a minority of participants. For instance, when one considers raw numbers, given the size of our sample, and in inferring beyond our sample to higher education students as whole. We also observed a range of differential demographics effects for both biopsychosocial stressors and measures of behavioral health functioning, something which others have recently reported as well.²²⁻
²⁵ Our results on this front support the continued need to further attend to such factors in future research.^{14,26} We generally did not, however, observe results suggesting that behavioral health functioning was improving or worsening across the semester cohorts (i.e., changing from earlier levels as the pandemic persisted).

We also found, consistent with our hypothesis, that select demographic variables, and several biopsychosocial stressors, were predictive of the various criterion variables—well-being, adaptive coping, depression,

anxiety, traumatic symptoms, substance use, and maladaptive coping. The most consistent demographic predictor was gender, though whether men or women presented increased risk depended on the outcome (e.g., women for depression and anxiety, men for drug use). This is roughly akin to findings by Freibott et al.²⁵ and Prowse et al.,²⁶ who suggested that gender differences with respect to behavioral health functioning may be explained by differential vulnerability to stress, use of social media, and willingness to report negative effects, among other possibilities. However, while others have observed women to be more consistently adversely impacted by the pandemic,²³⁻²⁴ differential gender effects may nonetheless be outcome-dependent.

The most consistent stressor predictors, in turn, were stress/worry, social isolation, discrimination, and prior mental health services, and directions of these stressor effects were generally as expected, for both adaptive and maladaptive indicators of behavioral health functioning (i.e., higher levels of the stressor suggestive of increased vulnerability for higher levels of the criterion variables). However, a few partially surprising effects were observed, such as worry/stress positively predicting adaptive coping (though such also positively predicted maladaptive coping). Possibilities for this unexpected finding include that persons experiencing more worry and stress may

have been more motivated in general to employ efforts to cope (both adaptive and less so), as potentially influenced by intervening variables that we did not measure (e.g., psychological resilience).⁵⁹ Somewhat similarly, the finding may reflect a characteristic of our primarily young adult sample, as others have also found younger adults to evidence greater worry/stress relative to older adults but to also use more coping strategies.⁶⁰

Limitations

Some of the most notable limitations of the current study were as follows. Regarding sampling validity, our sample primarily consisted of undergraduate students, and we recruited all participants from a single university in the Mid-Atlantic Region of the United States. In addition, we only examined omnibus demographic differences across study variables, and did not delve further into such effects (e.g., via conducting *post hoc* contrasts). Furthermore, while our sample size was relatively large, a fair amount of data was estimated via multiple imputation given the extent of missing data for individual items across participants. The limitations all bear on the generalizability of our data.

Regarding internal validity, all stressor independent variables were ad-hoc items and indexes; the psychometrics properties of these variables were not examined. As for statistical validity, we performed a fairly large number of statistical tests to examine the many variables of interest. While we attempted to control for risk of experiment-wise error via a Bonferroni correction, this procedure raised interpretive subjectivity about the extent of that correction, and which effects would be deemed statistically reliable. Finally, while we conducted predictive analyses, including with semester cohort strata as an independent variable, our data were nevertheless cross-sectional in nature. Relatedly, originally planned longitudinal data collection proved largely unsuccessful, and so this plan was dropped. Questions thus remain about the order of observed effects.

Implications

The limitations of the present study suggest several directions for future research. Most notably, more fine-grained analyses, in our sample and others, of demographic effects for biopsychosocial stressors and behavioral health functioning (e.g., subgroup contrasts). And longitudinal data collection to further examine the sequencing and trajectory of stressors and functioning. Considering all the societal changes the pandemic caused, the duration that such challenges endure post the introduction of vaccines is also worth monitoring. As for research syntheses, considering the evolving nature of the COVID-19 pandemic, including the significant changes that have occurred since baseline data collection for this study occurred, comparisons of studies like ours to future studies for which baseline data has not yet been collected will face a cohort artifact.

Our results also carry implications for higher education administrators and behavioral health providers serving members of campus communities (e.g., clinicians at college counseling centers and in private practice). Findings corroborate those reported by others that their constituents have likely been experiencing an increase in a range of stressors and behavioral health challenges in the times of COVID-19. While those previously connected to mental health services are likely to have been especially vulnerable during the pandemic (e.g., this index alone consistently related to all dependent variables), our raw estimates also suggest that many persons without a mental health history have also been experiencing increased stressors and behavioral health challenges. Investments in expansions of services to meet increased need for behavioral health supports, and outreach efforts for those without a history of accessing such services, likely remain warranted.

Conflict of Interest

We have no conflicts of interest to disclose.

References

1. Castaldelli-Maia JM, Marziali ME, Lu Z, et al. Investigating the effect of national government physical distancing measures on depression and anxiety during the COVID-19 pandemic through meta-analysis and meta-regression. *Psychol Med*. 2021; 51(6): 881-893. doi:10.1017/S0033291721000933
2. Prati G, Mancini AD. The psychological impact of COVID-19 pandemic lockdowns: a review and meta-analysis of longitudinal studies and natural experiments. *Psychol Med*. 2021; 51(2): 201-211. doi:10.1017/S0033291721000015
3. Şimşir Z, Koç H, Seki T, et al. The relationship between fear of COVID-19 and mental health problems: A meta-analysis. *Death Stud*. 2022; 46(3): 515-523. doi:10.1080/07481187.2021.1889097
4. Arora T, Grey I, Östlundh L, et al. The prevalence of psychological consequences of COVID-19: A systematic review and meta-analysis of observational studies. *J Health Psychol*. 2022; 27(4): 805-824. doi:10.1177/1359105320966639
5. Deng J, Zhou F, Hou W, et al. Prevalence of mental health symptoms in children and adolescents during the COVID-19 pandemic: A meta-analysis. *Ann NY Acad Sci*. 2023; 1520(1): 53-73. <https://doi.org/10.1111/nyas.14947>
6. Nochaiwong S, Ruengorn C, Thavorn K, et al. Global prevalence of mental health issues among the general population during the coronavirus disease-2019 pandemic: a systematic review and meta-analysis. *Sci Rep*. 2021; 11(1): 1-18. doi:10.1038/s41598-021-89700-8
7. Robinson E, Sutin AR, Daly M, et al. A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. *J Affect Disord*. 2022; 296: 567-576. doi:10.1016/j.jad.2021.09.098
8. Hao X, Qin Y, Lv M, et al. Effectiveness of telehealth interventions on psychological outcomes and quality of life in community adults during the COVID-19 pandemic: A systematic review and meta-analysis. *Int J Ment Health Nurs*. 2023; 32(4): 979-1007. <https://doi.org/10.1111/inm.13126>
9. Pierce BS, Perrin PB, Tyler CM, et al. The COVID-19 telepsychology revolution: A national study of pandemic-based changes in US mental health care delivery. *Am Psychol*. 2021; 76(1): 14-25. doi:10.1037/amp0000722

10. Zhu D, Paige SR, Slone H, et al. Exploring telemental health practice before, during, and after the COVID-19 pandemic. *J Telemed Telecare*. 2021; 30(1): 72-78. doi:10.1177/1357633X211025943
11. O'Connor RC, Wetherall K, Cleare S, et al. Mental health and well-being during the COVID-19 pandemic: longitudinal analyses of adults in the UK COVID-19 Mental Health & Wellbeing study. *Br J Psychiatry*. 2021; 218(6): 326-333. doi:10.1192/bjp.2020.212
12. Wang Y, Kala MP, Jafar TH. Factors associated with psychological distress during the coronavirus disease 2019 (COVID-19) pandemic on the predominantly general population: A systematic review and meta-analysis. *PLOS ONE*. 2020; 15(12): e0244630. doi:10.1371/journal.pone.0244630
13. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *J Affect Disord*. 2020; 277: 55-64. doi:10.1016/j.jad.2020.08.001
14. Charles NE, Strong SJ, Burns LC, et al. Increased mood disorder symptoms, perceived stress, and alcohol use among college students during the COVID-19 pandemic. *Psychiatry Res*. 2021; 296: 113706. doi:10.1016/j.psychres.2021.113706
15. Fang Y, Ji B, Liu Y, et al. The prevalence of psychological stress in student populations during the COVID-19 epidemic: a systematic review and meta-analysis. *Sci Rep*. 2022; 12(1): 12118. doi:10.1038/s41598-022-16328-7
16. Kim H, Rackoff GN, Fitzsimmons-Craft EE, et al. College mental health before and during the COVID-19 pandemic: Results from a nationwide survey. *Cognit Ther Res*. 2022; 46(1): 1-10. doi:10.1007/s10608-021-10241-5
17. Xu T, Wang H. High prevalence of anxiety, depression, and stress among remote learning students during the COVID-19 pandemic: Evidence from a meta-analysis. *Front Psychol*. 2023; 13: 1103925. <https://doi.org/10.3389/fpsyg.2022.1103925>
18. Kecojevic A, Basch CH, Sullivan M, et al. The impact of the COVID-19 epidemic on mental health of undergraduate students in New Jersey, cross-sectional study. *PLOS ONE*. 2020; 15(9): e0239696. doi:10.1371/journal.pone.0239696
19. Lee J, Solomon M, Stead T, et al. Impact of COVID-19 on the mental health of US college students. *BMC Psychol*. 2021; 9(1): 1-10. doi:10.1186/s40359-021-00598-3
20. Peng P, Hao Y, Liu Y, et al. The prevalence and risk factors of mental problems in medical students during COVID-19 pandemic: A systematic review and meta-analysis. *J Affect Disord*. 2023; 321: 167-181. <https://doi.org/10.1016/j.jad.2022.10.040>
21. Ren Z, Xin Y, Ge J, et al. Psychological impact of COVID-19 on college students after school reopening: a cross-sectional study based on machine learning. *Front Psychol*. 2021; 12: 641806. doi:10.3389/fpsyg.2021.641806
22. Batra K, Pharr JR, Kachen A, et al. Investigating the psychosocial impact of COVID-19 among the sexual and gender minority population: A systematic review and meta-analysis. *LGBT Health*. 2023; 10(6): 416-428. <https://doi.org/10.1089/lgbt.2022.0249>
23. Clabaugh A, Duque JF, Fields LJ. Academic stress and emotional well-being in United States college students following onset of the COVID-19 pandemic. *Front Psychol*. 2021; 12: 628787. doi:10.3389/fpsyg.2021.628787
24. Correia KM, Bierma SR, Houston SD, et al. Education racial and gendered disparities in COVID-19 worry, stress, and food insecurities across undergraduate biology students at a Southeastern university. *J Microbiol Biol Educ*. 2022; 23(1): e00224-21. doi:10.1128/jmbe.00224-21
25. Freibott CE, Stein MD, Lipson SK. The influence of race, sexual orientation and gender identity on mental health, substance use, and academic persistence during the COVID-19 pandemic: A cross-sectional study from a national sample of college students in the Healthy Minds Study. *Drug Alcohol Depend Rep*. 2022; 3: 100060. doi:10.1016/j.dadr.2022.100060
26. Prowse R, Sherratt F, Abizaid A, et al. Coping with the COVID-19 pandemic: Examining gender differences in stress and mental health among university students. *Front Psychiatry*. 2021; 12: 650759. doi:10.3389/fpsyg.2021.650759
27. Cheng C, Ying W, Ebrahimi OV, et al. Coping style and mental health amid the first wave of the COVID-19 pandemic: a culture-moderated meta-analysis of 44 nations. *Health Psychol Rev*. 2024; 18(1): 141-164. <https://doi.org/10.1080/17437199.2023.2175015>
28. de la Fuente J, Pachón-Basallo M, Santos FH, et al. How has the COVID-19 crisis affected the academic stress of university students? The role of teachers and students. *Front Psychol*. 2021; 12: 626340. doi:10.3389/fpsyg.2021.626340
29. Madrigal L, Blevins A. "I hate it, it's ruining my life": College students' early academic year experiences during the COVID-19 pandemic. *Traumatology*. 2022; 28(3): 325-335. doi:10.1037/trm0000336
30. SIRRINE EH, KLINER O, GOLLERY TJ. College Student Experiences of Grief and Loss Amid the COVID-19 Global Pandemic. *OMEGA (Westport)*. 2023; 87(3): 745-764. doi:10.1177/00302228211027461
31. Hossain MJ, Ahmmed F, Rahman SA, et al. Impact of online education on fear of academic delay and psychological distress among university students following one year of COVID-19 outbreak in Bangladesh. *Heliyon*. 2021; 7(6): e07388. doi:10.1016/j.heliyon.2021.e07388
32. Son C, Hegde S, Smith A, et al. Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *J Medical Internet Res*. 2020; 22(9): e21279. doi:10.2196/21279
33. Yang C, Chen A, Chen Y. College students' stress and health in the COVID-19 pandemic: The role of academic workload, separation from school, and fears of contagion. *PLOS ONE*. 2021; 16(2): e0246676. doi:10.1371/journal.pone.0246676
34. King CM, Del Pozzo J, Bomysoad R, et al. Experiences and functioning of New Jersey college students during the COVID-19 pandemic as relevant to psychology and social justice. *NJ Psychologist*. 2021; 71(3): 32-34.
35. Lamers SMA, Westerhof GJ, Bohlmeijer ET, et al. Evaluating the psychometric properties of the Mental Health Continuum-Short Form (MHC-SF). *J Clin Psychol*. 2011; 67(1): 99-110. doi:10.1002/jclp.20741
36. Keyes CL, Wissing M, Potgieter JP, et al. Evaluation of the mental health continuum-short form (MHC-SF) in setswana-speaking South Africans. *Clin Psychol Psychother*. 2008; 15(3): 181-192. doi:10.1002/cpp.572.
37. Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: A theoretically based approach. *J Pers Soc Psychol*. 1989; 56(2): 267-283. doi:10.1037/0022-3514.56.2.267
38. Meyer B. Coping with severe mental illness: Relations of the Brief COPE with symptoms, functioning, and well-being. *J Psychopathol Behav Assess*. 2001; 23(4): 265-277. doi:10.1023/A:1012731520781
39. Carver CS. You want to measure coping but your protocol's too long: Consider the Brief COPE. *Int J Behav Med*. 1997; 4(1): 92-100. doi:10.1207/s15327558ijbm0401_6
40. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983; 24(4): 385-396. doi:10.2307/2136404
41. Lee EH. Review of the psychometric evidence of the Perceived Stress Scale. *Asian Nurs Res*. 2012; 6(4): 121-127. doi:10.1016/j.anr.2012.08.004
42. Gupta R, Singh N, Kumar R. Longitudinal predictive validity of emotional intelligence on first year medical students perceived stress. *BMC Med Educ*. 2017; 17: 139. doi:10.1186/s12909-017-0979-z

43. Jiang JM, Seng EK, Zimmerman ME, et al. Evaluation of the reliability, validity, and predictive validity of the subscales of the Perceived Stress Scale in older adults. *J Alzheimer's Dis*. 2012; 59(3): 987-996. doi:10.3233/JAD-170289
44. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med*. 2001; 16(9): 606-613. doi:10.1046/j.1525-1497.2001.016009606.x
45. Fischer F, Levis B, Falk C, et al. Comparison of different scoring methods based on latent variable models of the PHQ-9: an individual participant data meta-analysis. *Psychol Med*. 2022; 52(15): 3472-3483. doi:10.1017/S0033291721000131
46. Spitzer RL, Kroenke K, Williams JB, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. 2006; 166(10): 1092-1097. doi:10.1001/archinte.166.10.1092
47. Plummer F, Manea L, Trepel D, et al. Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. *Gen Hosp Psychiatry*. 2016; 39: 24-31. doi:10.1016/j.genhosppsy.2015.11.005
48. Prins A, Ouimette P, Kimerling R, et al. The primary care PTSD screen (PC-PTSD): development and operating characteristics. *Prim Care Psychiatry*. 2003; 9(1): 9-14. doi:10.1185/135525703125002360.
49. Bovin MJ, Kimerling R, Weathers FW, et al. Diagnostic accuracy and acceptability of the Primary Care Posttraumatic Stress Disorder Screen for the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition) among US veterans. *JAMA Netw Open*. 2021; 4(2): e2036733. doi:10.1001/jamanetworkopen.2020.36733
50. Cheng P, Jasinski N, Zheng W, et al. Psychometric properties of the Primary Care PTSD Screen for DSM-5: Findings from family members of Chinese healthcare workers during the outbreak of COVID-19. *Front Psychiatry*. 2021; 12(1): 695678. doi:10.3389/fpsy.2021.695678
51. Prins A, Bovin MJ, Smolenski DJ, et al. The Primary Care PTSD Screen for DSM-5 (PC-PTSD-5): Development and evaluation within a veteran primary care sample. *J Gen Intern Med*. 2016; 31(10): 1206-1211. doi:10.1007/s11606-016-3703-5
52. World Health Organization, Babor TF, Higgins-Biddle JC, Saunderson JB, Monteiro MG. AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care (2nd ed.). World Health Organization. 2001. <https://apps.who.int/iris/handle/10665/67205>
53. Beard E, Brown J, West R, et al. Predictive validity, diagnostic accuracy and test-retest reliability of the Strength of Urges to Drink (SUTD) scale. *Int J Environ Res Public Health*. 2019; 16(19): 3714. doi:10.3390/ijerph16193714
54. Donovan DM, Kivlahan DR, Doyle SR, et al. Concurrent validity of the Alcohol Use Disorders Identification Test (AUDIT) and AUDIT zones in defining levels of severity among outpatients with alcohol dependence in the COMBINE study. *Addiction*. 2006; 101(12): 1696-1704. doi:10.1111/j.1360-0443.2006.01606.x
55. Maisto SA, Conigliaro J, McNeil M, et al. An empirical investigation of the factor structure of the AUDIT. *Psychol Assess*. 2000; 12(3): 346-353. doi:10.1037/1040-3590.12.3.346
56. Santos GM, Strathdee SA, El-Bassel N, et al. Psychometric properties of measures of substance use: a systematic review and meta-analysis of reliability, validity and diagnostic test accuracy. *BMC Med Res Methodol*. 2020; 20(1): 106. doi:10.1186/s12874-020-00963-7
57. Skinner HA. The Drug Abuse Screening Test. *Addict Behav*. 1982; 7(4): 363-371. doi:10.1016/0306-4603(82)90005-3
58. Cocco KM, Carey KB. Psychometric properties of the Drug Abuse Screening Test in psychiatric outpatients. *Psychol Assess*. 1998; 10(4): 408-414. doi:10.1037/1040-3590.10.4.408
59. Talik E. Worry and stress coping strategies among youth: the mediating role of psychological resilience. *Przegląd Psychologiczny*. 2002; 65(3): 113-128. doi:10.31648/przegldpsychologiczny.8804
60. Hunt S, Wisocki P, Yanko J. Worry and use of coping strategies among older and younger adults. *J Anxiety Disord*. 2003; 17(5): 547-560. doi:10.1016/S0887-6185(02)00229-3