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## Testing positive, losing a loved one, and financial hardship: Real-world impacts of COVID-19 on US college student distress

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### ABSTRACT

**Background:** The COVID-19 pandemic has taken a particularly heavy toll on U.S. college students. In addition to facing academic-related stress and social pressures, these individuals are now increasingly susceptible to experiences such as contracting the virus, losing loved ones to COVID-19, or facing financial hardship due to the pandemic. The effects of such personal, pandemic-related experiences on young adult mental health — and the inherent racial disparities within these outcomes — remain largely understudied.

**Methods:** We analyzed 65,568 undergraduate students from the Spring 2021 American College Health Association-National College Health Assessment (ACHA-NCHA).

**Results:** The rates of the aforementioned COVID-19-related stressors were unevenly distributed across racial groups. A logistic regression analysis to identify predictors of moderate and serious psychological distress revealed that participants who had experienced the death of a loved one had 1.14 times greater odds of developing psychological distress ( $p < 0.0001$ ). Those who experienced financial hardship had an odds ratio of 1.78 ( $p < 0.0001$ ). Surprisingly, testing positive for COVID-19 was associated with an odds ratio of 0.82 of psychological distress ( $p < 0.0001$ ).

**Limitations:** Self-reported measures are susceptible to recall bias and misinterpretation. Exposure and outcome variables were measured simultaneously in this cross-sectional study which limits inference on causality.

**Conclusions:** Financial burdens and bereavement are especially impactful stressors among college students during the pandemic, whereas contracting COVID-19 seemingly exhibits less impact on distress levels. When addressing student wellbeing, institutions should consider prioritizing the implementation of resources to support individuals affected by pandemic-related financial and familial losses.

### 1. Introduction

The COVID-19 pandemic has uniquely disrupted the life of college students, presenting a significant challenge given the already high rates of mental health concerns among this population (Huckins et al., 2020; Mack et al., 2021; Son et al., 2020; Zapata-Ospina et al., 2021). Unlike other individuals, college students primarily live and work on university and institutional campuses. The displacement of many college students from their campuses at the beginning of the pandemic led to a sudden

loss of campus resources, social networks, and other in-person support systems. Another major challenge was the adjustment to remote learning within a new environment (e.g., back home with parents and/or family) (Conrad et al., 2021; Huckins et al., 2020). Rates of anxiety and depression among U.S. college students, already climbing for years, reached unprecedented levels in 2020 with 6 out of every 10 students reporting symptoms of anxiety or depression (Lee et al., 2021; Liu et al., 2020; Wang et al., 2020).

In addition to these unique circumstances, college students have

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experienced pandemic-related hardships that may also affect their mental health and well-being, including losing family members to COVID-19, experiencing financial stress, or contracting COVID-19 themselves. While young people have been less likely to experience severe COVID-19 infections, people aged 18 to 29 years account for 16.4 % of all confirmed COVID-19 cases in the U.S. (Centers for Disease Control and Prevention, 2020). Although relatively less severe, contracting the COVID-19 virus and managing the illness and its contagion is yet another stressful event for college students, especially as they maintain other responsibilities, and may also take a toll on mental health. A meta-analysis of 31 studies on COVID-19-positive participants found a prevalence of depression, anxiety, and sleep disturbance of 45 %, 47 %, and 34 %, respectively (Deng et al., 2021). Racial minorities are experiencing a disproportionate burden of COVID-19 infections and hospitalizations with COVID-19 mortality rates up to 105 % higher than in White individuals (Mude et al., 2021).

Approximately 1 in 5 people in the U.S. have experienced the loss of a close friend or relative to COVID-19 (Neergaard et al., 2021). While such data on college students remain limited, one pre-pandemic study of 118 students from a single U.S. university suggested that 30 % of college students will have experienced the loss of a family member within the preceding 12 months (Balk et al., 2010). In that study, 1.7 % of the students who lost a family member within 12 months experienced prolonged grief disorder, which the authors define as distress for at least 6 months.

Young adults have also experienced significant financial hardship as a result of the pandemic. Unemployment constitutes one of the most commonly reported losses during the pandemic (Aucejo et al., 2020), with unemployment rates among 16-to-24 year olds reaching 24.4 % in Spring of 2020, up 16 % from the prior year (Gould and Kassa, 2020). Similar rates were seen in a cross-sectional study of 654 students from a private U.S. university, in which 28.3 % of the students reported losing their job or losing work hours (Birmingham et al., 2021). In that study, 40.8 % of the students reported that their financial situation worsened, 28 % reported being very concerned about their financial stability, and over half were anxious that they would be unable to make ends meet in the next few months. It is important to note that disparities exist in the financial repercussions of the pandemic, with Latinx and Black individuals reporting higher rates of economic challenges due to the pandemic compared to White individuals (Getachew et al., 2020).

Despite these challenges among young adults, very little research to date has examined rates of U.S. college students who tested positive for COVID-19, lost a loved one to COVID-19, and/or experienced financial hardship, or the association between these experiences and psychological distress. Psychological distress refers to a diverse set of cognitive, behavioral, emotional, and psychophysiological symptoms that are usually elevated in patients with depression, anxiety, burnout, and related mental health disorders (Dyrbye et al., 2006; Kessler et al., 2002), and which have implications for health-related quality of life (Mitchell and Beals, 2011). Around two-thirds of college students in the U.S. have moderate or severe psychological distress (American College Health Association, 2022). Psychological distress is a dimensional measure that was chosen over a more symptom-based measure (like anxiety or depression) given the multidimensional nature of the psychological response of college students during the COVID-19 pandemic and its ease of implementation for screening a broad college student population (Kessler et al., 2002; Li et al., 2021a; Son et al., 2020). Some psychological impacts are quantifiable, including depression, anxiety, stress, and PTSD (Li et al., 2021a). Other impacts are harder to quantify, like increased difficulty concentrating or increased social isolation (Son et al., 2020). Some impacts are multifactorial. For example, distress during COVID-19 was exacerbated by stressors that were not previously associated with health anxiety, like worrying about the socioeconomic impacts of getting sick (Taylor et al., 2020).

To further assess the personal experiences and the psychological distress of U.S. college students during the COVID-19 pandemic, this

study utilized a large nationwide sample of U.S. college students from Spring 2021 to determine rates of the following experiences: having tested positive for COVID-19, lost a loved one to COVID-19, and/or experiencing financial hardship, and to assess whether these experiences were associated with elevated levels of psychological distress. In selecting these stressors, we wanted to investigate the effects of circumstances that were highly prevalent to our population of college students (testing positive for COVID-19 and facing financial hardship) in addition to a personal life experience directly related to consequences of COVID-19 exposure (losing a loved one to COVID-19). We also stratified the rates by race/ethnicity. In doing so, we leveraged the large sample by disaggregating racial subgroups to better understand the experiences of Middle Eastern and Native Hawaiian/Pacific Islanders subgroups that are often aggregated with other groups or categorized as “other.”

## 2. Methods

### 2.1. Data source and sample

The American College Health Association – National College Health Assessment III (ACHA-NCHA) is a survey distributed twice-annually that assesses various health and behavioral aspects of US college students, including questions and standardized scales that tap into the study participants' physical health, mental health, habits, and perceptions (American College Health Association, 2021). This analysis is based on the Spring 2021 cross-sectional survey of the ACHA-NCHA, which was entirely web-based and had overall response rates of 12.8 %. The Spring 2021 survey includes 70,087 undergraduate students from 137 participating institutions across the US. Institutions were required to either survey all of their students or to use a random-sampling technique to survey their students. Data collection took place between January and early June, with most of the data collected during February and March 2021. For the purposes of our study, we included only the 65,568 undergraduate students who have completed the questionnaire items that went into our analysis. This analysis was exempt from human subjects review according to the Institutional Review Board of Mass General Brigham.

## 3. Measures

### 3.1. Predictors

#### 3.1.1. Tested positive

Students were asked whether they have ever had COVID-19. The options included “Yes (confirmed by a test),” “Maybe (e.g., I have had symptoms consistent with COVID-19, but it was not confirmed by a test),” “Probably not (no symptoms or other reason to think I have had it),” and “No (confirmed by a negative test).” Those who selected “Yes (confirmed by a test)” were referred to as the “Tested positive” group and the remainder were categorized as “Not tested positive.”

#### 3.1.2. Death of a loved one due to COVID-19

Students were asked whether someone close to them (a loved one, close family member, or friend) had died due to COVID-19. The options were dichotomous in the form of “yes” or “no.”

#### 3.1.3. Experienced financial hardship

Using a 5-point Likert scale, students indicated the effect of the COVID-19 pandemic on their financial situation. The options ranged from “A lot more stressful” to “A lot less stressful,” with the middle option indicating that there was “No significant change” to their financial situation. Students who selected “A lot more stressful” and those who selected “Somewhat more stressful” were categorized as “Yes, experienced financial hardship” group, whereas those who selected “No change in my level of stress,” “Somewhat decreased my level of stress,” or “Significantly decreased my level of stress” were categorized as “No,

did not experience hardship.”

### 3.2. Outcomes

#### 3.2.1. Psychological distress

The Kessler Screening Scale for Psychological Distress (Kessler et al., 2002) was used to assess the participants' psychological distress. Participants were asked on a scale of 0 (none of the time) to 4 (all of the time) how often they felt each of six different indicators: nervous, hopeless, restless or fidgety, so sad that nothing can cheer them up, that everything was an effort, and/or worthless. Cronbach's  $\alpha$  for these items in our sample was 0.89, indicating good reliability. As used previously (Yiengprugsawan et al., 2014), scores of 0 to 8 indicate no or low psychological distress, 9 to 12 indicate moderate psychological distress, and 13 to 24 indicate serious psychological distress. Our outcome was dichotomized with 1 indicating moderate-to-serious psychological distress and 0 indicating no or low psychological distress.

### 3.3. Covariates

#### 3.3.1. Anxiety diagnosis

Students were asked if they have ever been diagnosed with anxiety by a healthcare or mental health professional. The examples provided for anxiety disorders were generalized anxiety, social anxiety, panic disorder, and specific phobia. Students who answered “yes” to this question were coded as having ever had an anxiety diagnosis.

#### 3.3.2. Depression diagnosis

Students were asked if they have ever been diagnosed with depression by a healthcare or mental health professional. The examples provided for depressive disorders were major depression, persistent depressive disorder, and disruptive mood disorder. Students who answered “yes” to this question were coded as having ever had a depression diagnosis.

#### 3.3.3. Race/ethnicity

Students were asked to indicate how they usually describe themselves from a list of race/ethnicity options. They were able to select one or multiple of the available options and/or write their own if their choice is not listed. The available choices were “American Indian or Native Alaskan,” “Asian or Asian American,” “Black or African American,” “Hispanic or Latino/a/x,” “Middle Eastern/North African (MENA) or Arab Origin,” “Native Hawaiian or Other Pacific Islander Native,” “White,” “Biracial or Multiracial,” and “My identity is not listed above (please specify).” The participants who selected multiple options were merged with those who selected “Biracial or Multiracial” into one group referred to in our analysis as “Multiracial.” The self-identified groups were combined and referred to as the “Other” group.

#### 3.3.4. Sociodemographic characteristics

In addition to race/ethnicity, we included age, gender, international student status, and year in school as the sociodemographic covariates for our analysis. We categorized age as young (18 to 24 year olds) and older adults (25+ year olds). We used self-reported gender. Students who selected “woman or female” were coded as women and those who selected “man or male” were coded as men. Students who selected other gender identities were combined into one group. International student status was considered positive if the participant answered “yes” to the question about whether they needed a visa to study or work in the United States. Year in school included 1, 2, 3, 4, or 5+.

### 3.4. Data analysis

We used STATA (StataCorp, 2021) for our analyses. Data cleanup was done by dropping observations with extreme measures on anthropometry (height, weight, and body mass index) variables on par with

other studies (Gnatiuc et al., 2019), but we did not exclude the observations with missing values on these variables (<0.6 % excluded). We also excluded participants with missing data on any of the predictors or outcomes that went into our models (6.1 % excluded). The final sample size was 65,568 undergraduate students in the U.S.

We ran a descriptive analysis of our sample and presented the proportions of each of our sociodemographic characteristics and presented the totals in Table 1. We also assessed the proportions of the investigated personal COVID-19 experiences (tested positive to COVID-19, lost a loved one to COVID-19, or faced increased financial hardship due to the COVID-19 pandemic) by the sociodemographic characteristics. We then ran a multiple logistic regression predicting the odds ratio of having experienced each of the investigated factors based on the participants' race/ethnicity. We controlled for the sociodemographic characteristics and the other COVID-19 experiences. The purpose of these models was to present the distribution of the three COVID-19 experiences across the different race groups. For this reason, we decided to control for the other COVID-19 experiences regardless of the directionality of association. Both the unadjusted and adjusted models predicting the odds ratios of the COVID-19 experiences are presented in Table 2. Finally, we ran a multiple logistic regression predicting psychological distress levels based on the three investigated personal experiences while controlling for race/ethnicity and basic sociodemographic characteristics. We have clustered standard errors by institution to account for the possibility that observations within the same institution might be correlated. We used a significance level of  $p < 0.01$ .

## 4. Results

Table 1 summarizes the sociodemographic characteristics of our sample ( $N = 65,568$ ). 87.3 % of our sample of degree-seeking undergraduate students was 18 to 24 years old. 52.5 % were White, 15.4 % Hispanic, 13.7 % Asian, 3.1 % Black, 1 % Middle Eastern, 0.5 % American Indian, 0.3 % Native Hawaiian, and 12.7 % Multiracial. 68.2 % were women. Among the total sample, 6.1 % were international students. The distribution across the first 4 years of school was relatively similar with the third year comprising the majority at 26.5 %.

The distribution of our outcomes across the different subgroups is also presented in Table 1. Overall, 14.6 % of our sample had tested positive for COVID-19, 16.7 % had lost a loved one to COVID-19, and 63.3 % had experienced increased financial hardship due to the COVID-19 pandemic at the time that they completed the survey.

Table 2 summarizes the odds ratios of each of our predictors on having tested positive for COVID-19, having lost a loved one to COVID-19, or having experienced financial hardship due to the COVID-19 pandemic. There were no differences between the unadjusted and adjusted model; we therefore report the odds ratios from the adjusted model. Compared to White students, American Indian (OR: 1.25) and Hispanic (OR: 1.16) students had higher odds of having tested positive for COVID-19 while Asian (OR: 0.36,  $p < 0.0001$ ), Black (OR: 0.65,  $p < 0.0001$ ), Native Hawaiian (OR: 0.48), Multiracial (OR: 0.74,  $p < 0.0001$ ), and Other (OR: 0.66,  $p < 0.001$ ) groups had lower odds ratio of having tested positive to COVID-19. Compared to White students, all other racial/ethnic groups had significantly higher odds ratios of having lost a loved one to COVID-19 (OR range: 1.19–4.04,  $p < 0.0001$  -  $< 0.01$ ). All non-White groups showed significantly higher odds of having faced financial hardship due to COVID-19 than White students (OR range: 1.19–2.38,  $p < 0.0001$  -  $< 0.01$ ).

Table 3 summarizes the adjusted multiple logistic regression predicting psychological distress based on whether the participant had tested positive for COVID-19, experienced the death of a loved one due to COVID-19, or experienced increased financial hardship due to the COVID-19 pandemic (Block 1). Here, our adjusted model controls for race/ethnicity as well as other sociodemographic variables including age group, gender, international student status, and year in school (Block 2). The odds ratio of developing psychological distress was lower

**Table 1**

General demographic and key characteristics of our sample presented as total values and stratified by each of our predictors having tested positive for COVID-19, having lost a loved one to COVID-19, or having experienced financial hardship due to the COVID-19 pandemic, N (%).

Characteristic N (%)	Total	Tested positive to COVID-19		Death of a loved one due to COVID-19		Financial hardship due to COVID-19	
		No	Yes	No	Yes	No	Yes
	65,568 (100 %)	55,983 (85.4 %)	9585 (14.6 %)	54,639 (83.3 %)	10,929 (16.7 %)	24,038 (36.7 %)	41,530 (63.3 %)
<b>Age group</b>							
18–24	57,255 (87.3 %)	48,644 (86.9 %)	8611 (89.8 %)	48,253 (88.3 %)	9002 (82.4 %)	21,339 (88.8 %)	35,916 (86.5 %)
25+	8313 (12.7 %)	7339 (13.1 %)	974 (10.2 %)	6386 (11.7 %)	1927 (17.6 %)	2699 (11.2 %)	5614 (13.5 %)
<b>Race</b>							
American Indian	357 (0.5 %)	287 (0.5 %)	70 (0.7 %)	218 (0.4 %)	139 (1.3 %)	81 (0.3 %)	276 (0.7 %)
Asian	8970 (13.7 %)	8382 (15.0 %)	588 (6.1 %)	7803 (14.3 %)	1167 (10.7 %)	3324 (13.8 %)	5646 (13.6 %)
Black	2060 (3.1 %)	1828 (3.3 %)	232 (2.4 %)	1585 (2.9 %)	475 (4.3 %)	652 (2.7 %)	1408 (3.4 %)
Hispanic	10,089 (15.4 %)	8232 (14.7 %)	1857 (19.4 %)	6743 (12.3 %)	3346 (30.6 %)	2487 (10.3 %)	7602 (18.3 %)
Middle Eastern	645 (1.0 %)	552 (1.0 %)	93 (1.0 %)	487 (0.9 %)	158 (1.4 %)	210 (0.9 %)	435 (1.0 %)
Native Hawaiian	176 (0.3 %)	161 (0.3 %)	15 (0.2 %)	124 (0.2 %)	52 (0.5 %)	45 (0.2 %)	131 (0.3 %)
White	34,451 (52.5 %)	28,824 (51.5 %)	5627 (58.7 %)	30,411 (55.7 %)	4040 (37.0 %)	14,179 (59.0 %)	20,272 (48.8 %)
Multiracial	8346 (12.7 %)	7297 (13.0 %)	1049 (10.9 %)	6883 (12.6 %)	1463 (13.4 %)	2900 (12.1 %)	5446 (13.1 %)
Other	474 (0.8 %)	420 (0.7 %)	54 (0.6 %)	385 (0.7 %)	89 (0.8 %)	160 (0.7 %)	314 (0.8 %)
<b>Gender</b>							
Men	18,318 (27.9 %)	15,664 (28.0 %)	2654 (27.7 %)	15,870 (29.0 %)	2448 (22.4 %)	7931 (33.0 %)	10,387 (25.0 %)
Women	44,719 (68.2 %)	37,974 (67.8 %)	6745 (70.4 %)	36,580 (66.9 %)	8139 (74.5 %)	15,355 (63.9 %)	29,364 (70.7 %)
Other	2531 (3.9 %)	2345 (4.2 %)	186 (1.9 %)	2189 (4.1 %)	342 (3.1 %)	752 (3.1 %)	1779 (4.3 %)
<b>International</b>							
No	61,584 (93.9 %)	52,493 (93.8 %)	9091 (94.8 %)	51,341 (94.0 %)	10,243 (93.7 %)	22,680 (94.4 %)	38,904 (93.7 %)
Yes	3984 (6.1 %)	3490 (6.2 %)	494 (5.2 %)	3298 (6.0 %)	686 (6.3 %)	1358 (5.6 %)	2626 (6.3 %)
<b>Year in school</b>							
1st year undergraduate	15,798 (24.1 %)	13,444 (24.0 %)	2354 (24.6 %)	13,413 (24.5 %)	2385 (21.8 %)	6695 (27.9 %)	9103 (21.9 %)
2nd year undergraduate	13,925 (21.2 %)	11,824 (21.1 %)	2101 (21.9 %)	11,800 (21.6 %)	2125 (19.4 %)	5340 (22.2 %)	8585 (20.7 %)
3rd year undergraduate	17,400 (26.5 %)	14,913 (26.6 %)	2487 (25.9 %)	14,335 (26.2 %)	3065 (28.0 %)	5907 (24.6 %)	11,493 (27.7 %)
4th year undergraduate	13,742 (21.0 %)	11,719 (20.9 %)	2023 (21.1 %)	11,378 (20.8 %)	2364 (21.6 %)	4685 (19.5 %)	9057 (21.8 %)
5th year or more undergraduate	4703 (7.2 %)	4083 (7.4 %)	620 (6.5 %)	3713 (6.9 %)	990 (9.2 %)	1411 (5.8 %)	3292 (7.9 %)
Anxiety	19,136 (29.2 %)	16,385 (29.3 %)	2751 (28.7 %)	15,688 (28.7 %)	3448 (31.5 %)	5867 (24.4 %)	13,269 (32.0 %)
Depression	15,489 (23.6 %)	13,362 (23.9 %)	2127 (22.2 %)	12,696 (23.2 %)	2793 (25.6 %)	4496 (18.7 %)	10,993 (26.5 %)

in those who had tested positive for COVID-19 (OR: 0.82,  $p < 0.0001$ ). Participants who had experienced the death of a loved one had higher odds of experiencing psychological distress (OR: 1.14,  $p < 0.0001$ ) as did those students reporting increased financial hardship due to the COVID-19 pandemic (OR: 1.78,  $p < 0.0001$ ).

**5. Discussion**

The objective of this study was to examine the rates of college students who tested positive for COVID-19, lost a loved one to COVID-19, and those who experienced hardship as well as the extent to which these were associated with their levels of psychological distress. We also sought to examine racial/ethnic differences in students' COVID-19 experiences. Among the over 65,000 undergraduate students whose responses to the Spring 2021 survey were included in our analysis, approximately 1 out of 7 had tested positive for COVID-19, 1 out of 6 had lost a loved one to COVID-19, and nearly 2 out of 3 reported facing financial hardship.

**5.1. Racial disparities in COVID-19-related stressors**

Our results reveal racial disparities in the COVID-19 experiences of these students. Compared to White students, Hispanic/Latinx students were 16 % more likely to test positive for COVID-19, while Asian, Black, and Native Hawaiian students were about 38–66 % less likely to test positive for COVID-19. These trends are consistent with the CDC data on COVID-19 (Centers for Disease Control and Prevention, 2021b) showing that Asian, Pacific Islander, and Black populations had around 215 daily cases per 100,000 population, while White and Hispanic populations had 242 and 474 daily cases per 100,000 population, respectively, during January 2021 (Centers for Disease Control and Prevention, 2021b). Recognizing that COVID-19 data on Middle Eastern populations is largely lacking or miscategorized as White (Alsharif, 2021; Department of Commerce, 2018), we disaggregated the data to examine this

group on its own. In doing so, we found that they were statistically no different than Whites in terms of testing positive for COVID-19.

Relative to White students, students from every racial/ethnic background had significantly higher odds of having lost a loved one to COVID-19, with American Indian and Hispanic students having almost 5 and 4 times the odds, respectively, of having lost a loved one to COVID-19 compared to White students. Assuming that the losses may be of loved ones from their own racial/ethnic background, our rates are consistent with the high death rates reported in racial minorities (Centers for Disease Control and Prevention, 2021b; Mude et al., 2021; UCLA Center for Health Policy, 2021; Willey et al., 2022). American Indian and Hispanic populations had peak daily death rates of about 10 and 7 per 100,000 population, respectively, while White populations had a peak daily death rate of about 6 per 100,000 population during Winter of 2020 (Centers for Disease Control and Prevention, 2021b).

While other data have demonstrated financial stress to be another point of disparity, with Latinx and Black students experiencing economic challenges due to the pandemic at higher rates than White students (Getachew et al., 2020), all the racial/ethnic minorities in our sample were more likely to experience increased financial hardship due to the pandemic compared to White students. Furthermore, we also disaggregated American Indian and Native Hawaiian students to be examined as a group on their own to better inform our understanding of their experiences during the pandemic (Taparra et al., 2021; Yom and Lor, 2021), especially given recent data showing that American Indians and Native Hawaiians represent some of the highest rates of COVID-19 incidence and mortality (UCLA Center for Health Policy, 2021). In our dataset, we found that along with Hispanic students, American Indian and Native Hawaiian students had approximately double the odds of facing financial hardship due to COVID-19 compared to White students. The results shown in our U.S. college student sample reflect the high rates of financial hardship reported in some of these racial/ethnic groups (Noe-Bustamante et al., 2021; Taparra et al., 2021). As well, international students were more likely to experience increased financial

**Table 2**  
Multiple logistic regression models predicting the odds ratio of each of the COVID-19 experiences (having tested positive for COVID-19, having lost a loved one to COVID-19, or having experienced financial hardship due to the COVID-19 pandemic) across the different race groups.

Predictors	Unadjusted						Adjusted						
	Testing positive for COVID-19		Death of a loved one		Financial hardship		Testing positive for COVID-19		Death of a loved one		Financial hardship		
	OR	99 % CI	OR	99 % CI	OR	99 % CI	OR	99 % CI	OR	99 % CI	OR	99 % CI	
Race (Ref: White)													
American Indian	1.249	(0.884–1.766)	4.800***	(3.497–6.587)	2.383***	(1.611–3.525)	1.224	(0.881–1.700)	4.040***	(2.968–5.500)	2.072***	(1.411–3.045)	
Asian	0.360***	(0.285–0.453)	1.126	(0.954–1.329)	1.188*	(1.022–1.381)	0.342***	(0.269–0.434)	1.194*	(1.023–1.393)	1.305***	(1.143–1.491)	
Black	0.650***	(0.510–0.830)	2.256***	(1.951–2.608)	1.510***	(1.294–1.764)	0.622***	(0.489–0.792)	2.172***	(1.886–2.502)	1.510***	(1.297–1.759)	
Hispanic	1.156	(0.980–1.362)	3.735***	(3.365–4.146)	2.138***	(1.868–2.448)	1.059	(0.925–1.212)	3.444***	(3.110–3.815)	2.013***	(1.770–2.290)	
Middle Eastern	0.863	(0.647–1.152)	2.442***	(1.860–3.206)	1.449*	(1.054–1.991)	0.807	(0.604–1.077)	2.408***	(1.834–3.161)	1.422*	(1.034–1.955)	
Native Hawaiian	0.477	(0.208–1.097)	3.157**	(1.451–6.868)	2.036***	(1.375–3.016)	0.449*	(0.203–0.992)	2.950**	(1.351–6.441)	1.982***	(1.364–2.879)	
Multiracial	0.736***	(0.648–0.837)	1.600***	(1.414–1.810)	1.313***	(1.194–1.445)	0.723**	(0.636–0.820)	1.578***	(1.401–1.776)	1.301***	(1.194–1.417)	
Other	0.659**	(0.480–0.904)	1.740**	(1.134–2.670)	1.373*	(1.015–1.857)	0.687*	(0.508–0.929)	1.699*	(1.107–2.606)	1.394*	(1.038–1.871)	
18–24 (Ref: 25+)							1.385***	(1.131–1.696)	0.722***	(0.657–0.794)	1.003	(0.846–1.188)	
Gender (Ref: Men)													
Women							1.009	(0.893–1.141)	1.309***	(1.227–1.396)	1.329***	(1.247–1.416)	
Other							0.456***	(0.351–0.593)	0.957	(0.805–1.136)	1.557***	(1.327–1.827)	
International Student (Ref: Citizen/Resident)							1.004	(0.860–1.172)	0.987	(0.871–1.119)	1.127*	(1.007–1.262)	
Year in school (Ref: First year)													
Second year							1.006	(0.910–1.112)	1.002	(0.917–1.095)	1.184***	(1.105–1.269)	
Third year							0.964	(0.875–1.062)	1.071	(0.984–1.166)	1.371***	(1.266–1.484)	
Fourth year							0.998	(0.892–1.117)	1.042	(0.949–1.143)	1.373***	(1.258–1.498)	
Fifth year or more							0.930	(0.792–1.092)	1.140*	(1.022–1.273)	1.556***	(1.390–1.743)	
Anxiety diagnosis							0.984	(0.896–1.082)	1.133***	(1.049–1.223)	1.182***	(1.109–1.260)	
Depression diagnosis							0.900*	(0.821–0.987)	1.067	(0.978–1.163)	1.381***	(1.286–1.482)	
Death of a Loved One to COVID-19							1.302***	(1.184–1.433)			1.652***	(1.527–1.786)	
Financial Hardship due to COVID-19							1.167**	(1.051–1.295)	1.657***	(1.531–1.793)			
Tested Positive for COVID-19									1.299***	(1.179–1.430)	1.168**	(1.053–1.297)	

\*\*\* p < 0.0001.  
\*\* p < 0.001.  
\* p < 0.01.

**Table 3**

Multiple logistic regression models predicting the odds ratio of having moderate-to-serious psychological distress based on the COVID-19 experiences – having tested positive for COVID-19, having lost a loved one to COVID-19, or having experienced financial hardship due to the COVID-19 pandemic. The adjusted model controls for race/ethnicity, age group, gender, international student status, and year in school.

Predictors	(1)		(2)	
	Unadjusted		Adjusted	
	OR	99 % CI	OR	99 % CI
Race (Ref: White)				
American Indian			0.863	(0.616–1.211)
Asian			1.707***	(1.561–1.866)
Black			1.085	(0.927–1.271)
Hispanic			1.201***	(1.093–1.320)
Middle Eastern			1.877***	(1.384–2.545)
Native Hawaiian			1.283	(0.813–2.026)
Multiracial			1.279***	(1.165–1.405)
Other			1.285	(0.975–1.695)
18–24 (Ref: 25+)			1.866***	(1.688–2.062)
Gender (Ref: Men)				
Women			1.363***	(1.273–1.459)
Other			4.649***	(3.611–5.985)
International Student (Ref: Citizen/Resident)			0.948	(0.849–1.058)
Year in school (Ref: First year undergraduate)				
Second year undergraduate			1.023	(0.937–1.116)
Third year undergraduate			0.968	(0.902–1.038)
Fourth year undergraduate			0.826***	(0.757–0.902)
Fifth year or more undergraduate			0.962	(0.843–1.097)
Anxiety diagnosis			2.178***	(2.001–2.370)
Depression diagnosis			2.915***	(2.578–3.295)
Tested Positive to COVID-19	0.780***	(0.714–0.852)	0.818***	(0.757–0.885)
Death of a Loved One to COVID-19	1.146***	(1.058–1.241)	1.143***	(1.060–1.233)
Financial Hardship due to COVID-19	1.940***	(1.834–2.052)	1.780***	(1.692–1.871)

\*\*\* p < 0.0001.

hardship due to the pandemic. This was expected given the minimal financial support provided to international students. For example, international students are not eligible for U.S. government-funded financial aid (Homeland Security, 2022).

5.2. COVID-19-related stressors and psychological distress

We examined whether contracting COVID-19, losing a loved one to COVID-19, or increased financial hardship was associated with students' psychological distress while accounting for the effects of race/ethnicity and other sociodemographic factors. Among these three experiences, increased financial hardship showed the highest association with psychological distress, roughly doubling the likelihood that a student reported moderate-to-serious psychological distress. Losing a loved one to COVID-19 was also associated with more modest elevated odds of psychological distress, but interestingly, contracting COVID-19 was associated with significantly less psychological distress.

The association between increased financial hardship and psychological distress is in line with previous findings suggesting financial stress is a major contributor to mental health concerns among U.S. college students and young adults (Archuleta et al., 2013; Birmingham et al., 2021; Liu et al., 2022; The Harris Poll, 2021; Tran et al., 2018). The association between having lost a loved one and higher odds of psychological distress was also expected given the significant impact of

bereavement on the mental health of students (Balk, 2008; Valentine and Woodthorpe, 2020). Indeed, previous findings have shown that students may be more vulnerable to the effects of bereavement than older adults (Valentine and Woodthorpe, 2020). During COVID-19, many college students reported that stress of losing a loved one was the most significant factor affecting their mental health (Lee et al., 2021). Bereavement is a normal response to loss and should not be disabling nor should it cause significant dysfunction as would be seen in severe psychological distress (Zisook and Shear, 2009). Still, bereavement has been shown to have a significant impact on students' mental health and cognitive skills as they cope with intensely painful emotions and may experience a significant drop in academic performance (Balk, 2008; Servaty-Seib and Hamilton, 2006; Valentine and Woodthorpe, 2020).

Interestingly, according to our analysis, students who tested positive for COVID-19 appear to be at lower risk of psychological distress, and this was true even after controlling for participant's age, race, gender, international student status, year of school, and endorsement of either of the other two experiences. This is in contrast to previous literature that suggests worse mental health outcomes in COVID-19 patients (Mohammadian Khonsari et al., 2021; Rodríguez-Rey et al., 2020; Taquet et al., 2021). It is possible that some of the students who tested positive were asymptomatic, as previous data on those who are regularly tested indicate that about half of those who are SARS-CoV-2 positive may be asymptomatic (Oran and Topol, 2020). Such asymptomatic cases may be more prevalent than in the general population since many schools implemented policies for consistent testing among their students. That said, even among the symptomatic cases, COVID-19 is in general less severe among young adults compared to the general population (Centers for Disease Control and Prevention, 2021a), and thus the experience of having COVID-19 may be less distressing psychologically for young people. Students who tested positive may consider themselves resilient for having overcome the condition. In a longitudinal study assessing the mental health of college students during the COVID-19 pandemic, Li et al. found students are worrying less about getting infected as the pandemic progresses (Li et al., 2021b). Additionally, being ill is perhaps a shorter-term concern for young people relative to the long-term grief of losing a family member or the uncertainty and chronicity of financial stress. Taken together, the conditions which endure and reflect greater uncertainty over time could have a greater psychological impact on college students.

The association between testing positive for COVID-19 and reporting lower psychological distress might also be confounded by protective factors inherent in the characteristics of the students who tested positive compared to those who did not. It could be that students who tested positive were more likely to be part of college activity groups like varsity sports, intramural sports, or fraternities/sororities. Being part of an activity group might be protective; Edwards et al. found in their study of about half a million college students from 2011 to 2019 that self-reported anxiety and mood disorder symptoms were lower in student athletes than in non-athletes (Edwards et al., 2021).

6. Limitations

These results must be interpreted within the context of the study design, and several limitations exist. First, despite institutions requiring that either all students or a random subset be invited to participate in the survey, there may be systematic differences between the students who elect to participate and those who do not. As well, institutions can self-select to participate in the ACHA-NCHA. These two factors may introduce sampling bias. The lack of non-response data limits weighting techniques. Second, due to the nature of the national survey upon which our analysis was conducted, all measures are self-reported, and therefore susceptible to recall bias and misinterpretation. Third, since this is a cross-sectional study, all of the exposure and outcome variables were measured simultaneously. Hence, directionality and causality of

associations cannot be assessed. Prospective studies are required to assess causation. Fourth, there may be other stressors that college students experienced that were not captured in this analysis. For example, some other stressors include being placed in quarantine, prolonged use of social media, substance use, and having social support. Fifth, participants who identified with more than one race/ethnicity were coded as multiracial. Due to the many different possibilities for what that category could represent, the multiracial group might be too heterogeneous for a generalizable result. As well, there may be racially mixed individuals who did not choose to identify as multiracial. Furthermore, formal categorization or how one self-identifies can change over time. Finally, American Indian, Middle Eastern, Native Hawaiian, and ‘Other’ race groups each represented 1 % or less of the total sample size. This might make their analyses underpowered. Data on college students should seek to include greater numbers of participants particularly from underrepresented groups so that future research can be powered to address disparities due to the pandemic.

## 7. Conclusion/implication

Our results highlight the importance of understanding the relative effects of different pandemic-related factors on college students' well-being. Our results further highlight the inequitable burden of certain COVID-19 experiences on racial minority groups. Regardless of the direct physical effects of COVID-19, it seems that indirect psychosocial and emotional effects of losing loved ones and/or facing financial hardships might exert a significant harmful impact on students' mental health.

Consideration of these experiences is warranted as colleges attempt to allocate attention and resources to support the well-being of U.S. college students during the pandemic. For instance, universities' support of their bereaved students can play a role in reducing their mental health concerns (Valentine and Woodthorpe, 2020). One such example is an “in memoriam” page set up by City University of New York (CUNY) to memorialize faculty, staff, students, alumni, and retirees who have passed away (City University of New York, 2022; Herder, 2021). CUNY's approach differs in that it set up a page to remember members and students of their school while our results imply the need to support students who lost loved ones. Even so, CUNY's approach is a step in the right direction.

Our data also suggest the importance of continued and enhanced financial support for college students. One such example is Boston University's food pantry program that aims to end food insecurity for all of their students (Boston University, 2022). Another example is The Steve Fund that is dedicated to improving the mental health of students of color through different colleges and universities (Chavous and Primm, 2020). Meanwhile, contracting COVID-19 itself may not be a source of significant distress for students. Institutions should consider the relative impact of the different experiences college students are going through when prioritizing their support programs. As well, efforts should be made to ensure equitable access to institutions' resources and support services across students of all races and ethnicities.

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## IRB approval status

This analysis was exempt from human subjects review according to the Institutional Review Board of Mass Brigham General.

## Reprint requests

Cindy H. Liu, Ph.D.

## Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## CRediT authorship contribution statement

**Abdelrahman ElTohamy:** Data curation, Methodology, Writing-Original draft preparation.

**Sunah Hyun:** Conceptualization, Data curation.

**Anjeli R. Macaranas:** Writing - Original draft preparation.

**Justin A. Chen:** Writing - Reviewing and Editing.

**Courtney Stevens:** Writing - Reviewing and Editing.

**Cindy H. Liu:** Supervision, Writing - Reviewing and Editing, Resources, Funding acquisition.

## Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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