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Association between COVID-19-related loneliness or worry and symptoms of anxiety and depression among first-year college students

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Abstract

Objective: To examine the relationship between COVID-19-related distress and mental health among first-year college students.

Participants: Data for this longitudinal study (n=727) were collected before the school year (August 2019), end of fall semester (December 2019), and soon after the university suspended in-person instruction (April 2020).

Methods: We used multivariable log-linear and logistic regressions to examine continuous and dichotomous outcomes on the 9-item Patient Health Questionnaire and the 7-item Generalized Anxiety Disorder scale.

Results: The most consistent predictor of during-pandemic mental health was feeling extremely isolated (versus not at all), which was associated with increased symptom severity of depression (proportional change[95% CI]=2.43[1.87, 3.15]) and anxiety (2.02[1.50, 2.73]) and greater odds of new moderate depression (OR[95% CI]=14.83[3.00, 73.41]) and anxiety (24.74[2.91, 210.00]). Greater COVID-19-related concern was also related to increased mental health symptoms.

Conclusions: Results highlight the need for mental health services during crises that lead to social isolation.

Keywords

COVID-19; Loneliness; Anxiety; Depression

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Introduction

Many have raised concerns about the negative mental health impact of the COVID-19 pandemic and associated shutdowns.[1–4] These concerns are, in part, informed by the knowledge that social isolation and loneliness are related to poor mental health.[5–8] Mental health consequences have been observed in past epidemics, particularly among those who have had to quarantine.[9,10] College students may be particularly susceptible to these impacts of pandemic-related disruptions.

Early evidence has documented mental health consequences of the COVID-19 pandemic. For example, as COVID-19 cases climbed, people increasingly conducted online searches for mental health terms, particularly suicidal ideation and anxiety terms.[11] Adults in the U.S. and Canada experiencing symptoms of anxiety or depression were more likely to report COVID-related stress and isolation-related distress.[12] Greater COVID-19-related fears are related to higher levels of depression and anxiety symptoms.[13] However, the mental health impact of COVID-19 may vary by demographic groups. For example, among U.S. adults aged 18–100, age was negatively associated with negative economic effects of the pandemic.[14]

Young adults may be particularly vulnerable to pandemic-related mental health consequences given this demographic has the highest prevalence of a past-year major depressive episode[15] and about one in five have an anxiety disorder.[16] Among college students in the U.S. (about half of young adults[17]), depression and anxiety symptoms were higher during the start of the pandemic than during the previous academic term.[18] Cross-sectional research in the U.S. has indicated that most college students have experienced increased stress during the pandemic.[19] Outside the U.S., some have found higher levels of depression and anxiety in University students compared to University workers,[20] healthcare workers,[21] or national norms.[22] Factors such as financial stability and social support have been shown to be protective for anxiety during the pandemic.[23]

We examined mental health among first-year U.S. college students before and during the pandemic using longitudinal data. We hypothesized that COVID-related loneliness, worry about the COVID-19 situation, and concern about getting COVID-19 would be related to greater depression and anxiety symptoms after the university suspended in-person instruction (spring 2020).

Method

Sample

Data in this study are from a trial of a preventive intervention for alcohol use, which was approved by the Institutional Review Board at the University of Minnesota.[24] Prior to the start of the 2019–2020 school year, a random sample of 1500 first-year students, aged 18–23 were invited to participate in the study. Participants provided consent and completed online surveys. At baseline, 891 students (59%) consented. The intervention took place during fall 2019. Data for the present study came from the first follow-up (December 2019; pre-pandemic) and second follow-up (April 2020; during-pandemic); in addition, demographic

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covariates used in the analyses were collected at baseline (August 2019). Of the 735 students who took the follow-up surveys, 727 had complete data on relevant survey questions and were included in the analytic sample. A majority of the analytic sample was female (464, 63.8%), non-Hispanic white (562, 77.3%), and lived in campus housing at baseline (676, 93.0%) (see Table 1). The analytic sample did not differ significantly from the full baseline sample on any baseline variables (including demographics and mental health) used in this study.

At the university, spring break coincided with a rapid change in the local response to the COVID-19 pandemic. While students were on spring break (March 9–13, 2020), the university suspended classes (i.e., break was extended to March 18, and then all classes moved to online delivery). The timing of these changes created an opportunity to clearly assess mental health before and after the pandemic-related restrictions.

Measures

Depression and Anxiety Symptoms—Symptoms of depression were assessed with the 9-item Patient Health Questionnaire (PHQ-9).[25] To examine overall changes in symptomology as well as recent onset of moderate symptoms, the PHQ-9 was used in separate analyses as a continuous outcome (range 0–27) and as a dichotomous outcome, with scores at or above 10 indicating moderate depressive symptoms and likely Major Depressive Disorder.[25] Symptoms of anxiety were assessed with the 7-item Generalized Anxiety Disorder scale (GAD-7).[26] The GAD-7 ranges from 0–21 and was used as a continuous and dichotomized measure, with scores at or above 8 indicating possible anxiety disorders (because studies have shown that 8+ provides optimal specificity and sensitivity to identify any anxiety disorder).[27,28] Sensitivity analyses (available upon request) were very similar for all outcomes using the cutoff of 10. The PHQ-9 and GAD-7 were included in the pre-pandemic and during-pandemic surveys.

COVID-related Distress—Three items in the during-pandemic survey captured students' distress related to COVID-19. Feelings of isolation were measured by "How much has the COVID-19 situation made you feel isolated or alone?" with five response options ranging from *not at all* to *extremely*. General worry was measured by "How worried are you about the current situation regarding COVID-19?" with five response options ranging from *not at all worried* to *extremely worried*. Personal health concern was measured by "How concerned are you about getting or having COVID-19?" with three response options from *not at all* to *very much*.

Covariates—Financial stress was measured by two questions on the during-pandemic survey: "As you reflect back on this semester [before/after] spring break, how much stress did finances cause you?" with five responses from *none* to *extreme amount*. Based on previous research that has shown an impact of financial stress on wellbeing among college students during the COVID-19 pandemic,[23] an indicator of increased financial stress from pre- to post-spring break was computed and included in all multivariable models. Age, sex, and race (non-Hispanic white, other) were included in all multivariable models.

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Analysis

To test whether there was a significant difference in mean symptomology from pre-pandemic to during pandemic, we used paired t-tests. To test whether there was a significant difference in the number of moderate cases, we used McNemar's test. For the primary analyses, we fit a separate model for each of four outcomes: depression symptom severity, onset of moderate (or higher) depressive symptoms, anxiety symptom severity, and onset of moderate (or higher) anxiety symptoms. To examine the associations between COVID-related distress and symptom severity, we used multivariable log-linear regression models with robust sandwich-type standard errors. This approach yields estimated coefficients that are consistent and asymptotically normal, provided the mean model is correctly specified. Linear regression was also considered, but quantile-quantile plots indicated violations of the assumption of normal residuals. Control variables in all models included intervention condition and pre-pandemic scores of depression and anxiety. To examine the association between COVID-related distress and onset of moderate symptoms, we used logistic regression and included only those students who were below the respective cutoffs in the pre-pandemic survey. The significance of all predictors was assessed using Wald tests, and the overall significance of each COVID-related question was assessed using joint Wald tests for the log-linear models and likelihood ratio tests for the logistic models, where the full model was compared with a model lacking that factor. All analyses were conducted in R version 3.6.2.

Results

From pre-pandemic to during-pandemic, the mean (95% CI) PHQ-9 score increased from 5.70 (5.33, 6.07) to 6.83 (6.43, 7.23) ($p<0.001$). Indicating moderate depression symptoms, 140 students (19.3%) had PHQ-9 scores of 10 or above in the pre-pandemic, which increased to 202 students (27.8%) during the pandemic ($p<0.001$). The mean GAD-7 score increased from 5.07 (4.73, 5.41) to 5.67 (5.30, 6.04) ($p<0.001$); 177 students (24.3%) had GAD-7 scores of 8 or above pre-pandemic, which increased to 215 (29.6%) during the pandemic, indicating moderate anxiety ($p=0.003$). Almost half of the students (336, 46.2%) reported feeling quite a bit or extremely isolated due to the COVID-19 pandemic; 222 (30.5%) reported feeling very or extremely worried about the COVID-19 situation; and 60 (8.3%) reported being very concerned about getting COVID-19.

Results from the four regression models are shown in Tables 2 and 3. COVID-19-related variables were each related to depression and anxiety outcomes. The largest effect sizes were for feelings of isolation; feeling extremely isolated (relative to not at all) was associated with depression symptom severity (proportional change[95% CI]=2.43[1.87, 3.15]), anxiety symptom severity (2.02[1.50, 2.73]), greater odds of moderate depression symptom onset (OR[95% CI]=14.83[3.00, 73.41]), and greater odds of moderate anxiety symptom onset (24.74[2.91, 210.00]). Feeling extremely worried (relative to not at all) was associated with symptom severity of depression (proportional change[95% CI]=1.39[(1.05, 1.86)]) and anxiety (1.71[1.25, 2.33]); however, in logistic regression models, general worry about COVID-19 was only associated overall with onset of moderate anxiety. Conversely, concern about getting or having COVID-19 was not related to symptom severity in either model, but

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feeling very concerned about getting COVID-19 (relative to not at all) was associated with greater odds of moderate depression symptom onset (OR[95% CI]=2.81[1.14, 6.94]) and moderate anxiety onset (3.06[1.14, 8.21]).

Female sex was associated with anxiety symptom severity (proportional change[95% CI]=1.13[1.01,1.26]). An increase in financial stress from pre- to post-spring break (compared to a decrease or no change) was associated with depression symptom severity (1.16[1.05, 1.29]) and anxiety symptom severity (1.21[1.09,1.35]).

Discussion

Early evidence suggests that the COVID-19 pandemic and associated shutdowns and quarantines have negatively impacted mental health.[12,13] Study findings from around the world have provided evidence that this is also the case in college student populations.[18–23] The present study adds to this literature by showing that symptoms of depression and anxiety among a cohort of first-year college students in the U.S increased from pre-COVID (end of fall semester 2019) to the spring (2020), during the pandemic and after the university suspended in-person instruction. This change differs from the typical trajectory of first-year college students, in which mental health and well-being generally improves or remains level from the first semester to the second semester of college.[29–31] Our results showed that during the early phases of the pandemic, almost half of students felt quite or extremely isolated, and nearly three out of ten screened positive for possible depression (27.8%) or anxiety disorders (29.6%). Similar to other findings among college students,[32] we found that more students were concerned about the COVID-19 situation in general than they were about their own COVID-19-related health risk.

Our findings fully supported our hypotheses that COVID-related loneliness would be related to greater depression and anxiety symptoms, and partially supported our hypotheses regarding worry about the COVID-19 situation and concern about getting COVID-19. Worry about the COVID-19 situation was more consistently associated with mental health symptom severity, while concern about getting COVID-19 was only associated with onset of moderate or greater symptoms. These findings add to other studies showing a relationship between COVID-19-related worry and mental health.[13] The largest effects we found were from feelings of isolation, which aligns with research showing a link between loneliness and mental health,[5–8] and showing that quarantines in previous epidemics negatively impacted mental health.[9,10]

Prevalence of anxiety and depression are typically higher among females,[15,16] which was observed in our sample for anxiety symptoms but not depression. Consistent with previous research,[33] financial stress was associated with higher depression and anxiety symptoms. Between the models examining symptom severity and moderate symptom onset, there were some differences in the sets of significant predictors, which likely reflects the different measures of effect size being estimated and the lower power of the onset models.

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Strengths and limitations

The primary strength of this study was the large sample, which was being followed before the COVID-19 pandemic and assessed again during the pandemic, after the university suspended in-person instruction and a statewide stay-home order was issued. The primary limitation of this study is the single (predominantly white, Midwestern) university sample; therefore, these results might not generalize to all university students in the U.S.

Conclusions

This study underscores the need for consistent mental health services for college students throughout the pandemic and during other crises that lead to social isolation. Feelings of isolation may be an important risk factor to include when assessing students' mental health and may constitute a specific target of intervention, whether related to the pandemic or more broadly. Colleges may need to give extra consideration to these topics in first-year students, many of whom are living independently for the first time.

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Table 1:

Characteristics of sample (n=727)

	n (%)
Age (years)	
18	683 (93.9%)
19	43 (5.9%)
20	1 (0.1%)
Sex	
Male	263 (36.2%)
Female	464 (63.8%)
Race/ethnicity	
Non-Hispanic White	562 (77.3%)
Non-Hispanic Black	24 (3.3%)
Other/Multi	141 (19.4%)
Baseline living situation	
Campus housing	676 (93.0%)
Other	51 (7.0%)
Financial stress (change from pre- to post-spring break)	
Decreased or stayed same	584 (80.3%)
Increased	143 (19.7%)
Feeling isolated or alone due to COVID-19	
Not at all	56 (7.7%)
A little	170 (23.4%)
Moderately	165 (22.7%)
Quite a bit	225 (30.9%)
Extremely	111 (15.3%)
Worry about the current COVID-19 situation	
Not at all worried	65 (8.9%)
A little worried	165 (22.7%)
Moderately worried	275 (37.8%)
Very worried	174 (23.9%)
Extremely worried	48 (6.6%)
Concern about getting or having COVID-19	
Not at all	278 (38.2%)
Somewhat	389 (53.5%)
Very much	60 (8.3%)

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Table 2:

Results from multivariable log-linear and logistic models of during-pandemic PHQ-9

	PHQ severity [a]					PHQ ≥ 10 [b]				
	Coef.	Wald z-stat.	Proportional change (95% CI)	P-value		Coef.	Wald z-stat.	OR (95% CI)	P-value	
				Coef.	Overall				Coef.	Overall
Age	−0.18	−1.60	0.84 (0.67, 1.04)	0.109		−0.29	−0.46	0.75 (0.21, 2.62)	0.647	
Female sex	0.08	1.58	1.09 (0.98, 1.20)	0.115		0.17	0.63	1.19 (0.70, 2.03)	0.526	
Hispanic ethnicity or non-White race	0.02	0.43	1.02 (0.92, 1.15)	0.668		0.38	1.34	1.46 (0.84, 2.56)	0.181	
Pre-pandemic PHQ score	0.06	13.32	1.06 (1.05, 1.07)	<0.001		0.32	6.49	1.37 (1.25, 1.51)	<0.001	
Increase in financial stress over spring break	0.15	2.80	1.16 (1.05, 1.29)	0.005		0.49	1.65	1.63 (0.91, 2.92)	0.099	
Feeling isolated or alone due to COVID-19 (ref=Not at all)										
A little	0.24	1.75	1.27 (0.97, 1.66)	0.080	<0.001	0.38	0.44	1.46 (0.27, 7.79)	0.657	<0.001
Moderately	0.53	4.12	1.69 (1.32, 2.17)	<0.001		1.58	1.94	4.86 (0.98, 23.97)	0.052	
Quite a bit	0.67	5.30	1.94 (1.52, 2.49)	<0.001		1.95	2.44	7.04 (1.47, 33.63)	0.015	
Extremely	0.89	6.72	2.43 (1.87, 3.15)	<0.001		2.70	3.30	14.83 (3.00, 73.41)	<0.001	
Worry about the current COVID-19 situation (ref=Not at all worried)										
A little worried	0.06	0.46	1.06 (0.82, 1.39)	0.646	0.024	−0.29	−0.47	0.75 (0.23, 2.50)	0.640	0.316
Moderately worried	0.20	1.55	1.23 (0.95, 1.58)	0.120		0.28	0.49	1.33 (0.43, 4.09)	0.621	
Very worried	0.22	1.64	1.25 (0.96, 1.63)	0.101		−0.19	−0.31	0.82 (0.25, 2.76)	0.753	
Extremely worried	0.33	2.27	1.39 (1.05, 1.86)	0.023		0.42	0.59	1.53 (0.37, 6.24)	0.554	
Concern about getting or having COVID-19 (ref=Not at all)										
Somewhat	−0.05	−1.00	0.95 (0.86, 1.05)	0.317	0.218	0.11	0.37	1.11 (0.63, 1.95)	0.712	0.065
Very much	0.07	0.85	1.07 (0.91, 1.27)	0.394		1.03	2.24	2.81 (1.14, 6.94)	0.025	
	Comparison with intercept-only model: Joint Wald test statistic=620.38, chi-squared df=16, p=<0.001					Comparison with intercept-only model: Likelihood ratio test statistic=137.46, chi-squared df=16, p=<0.001				

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[a] Model N=727 students, multivariable log-linear regression with robust standard errors

[b] Model N=587 students with PHQ-9 below 10 on pre-pandemic (December 2019) survey, multivariable logistic regression

Note: Both models controlled for study intervention assignment (treatment/control), which was not significant in either model.

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Table 3:

Results from multivariable log-linear and logistic models of during-pandemic GAD-7

	GAD severity [a]					GAD ≥ 8 [b]				
	Coef.	Wald z-stat.	Proportional change (95% CI)	P-value		Coef.	Wald z-stat.	OR (95% CI)	P-value	
				Coef.	Overall				Coef.	Overall
Age	0.09	0.70	1.09 (0.86, 1.39)	0.484		0.62	1.07	1.85 (0.60, 5.71)	0.284	
Female sex	0.12	2.08	1.13 (1.01, 1.26)	0.037		0.45	1.52	1.58 (0.88, 2.83)	0.128	
Hispanic ethnicity or non-White race	−0.04	−0.59	0.96 (0.85, 1.09)	0.552		0.12	0.37	1.12 (0.60, 2.09)	0.711	
Pre-pandemic GAD score	0.07	13.82	1.07 (1.06, 1.08)	<0.001		0.32	5.00	1.37 (1.21, 1.56)	<0.001	
Increase in financial stress over spring break	0.19	3.47	1.21 (1.09, 1.35)	<0.001		0.12	0.35	1.13 (0.58, 2.20)	0.725	
Feeling isolated or alone due to COVID-19 (ref=Not at all)										
A little	0.18	1.16	1.19 (0.88, 1.61)	0.246	<0.001	0.85	0.75	2.34 (0.25, 21.66)	0.454	<0.001
Moderately	0.39	2.62	1.48 (1.10, 1.99)	0.009		2.30	2.13	10.02 (1.20, 83.77)	0.033	
Quite a bit	0.59	3.96	1.80 (1.35, 2.41)	<0.001		2.88	2.68	17.85 (2.16, 147.19)	0.007	
Extremely	0.70	4.58	2.02 (1.50, 2.73)	<0.001		3.21	2.94	24.74 (2.91, 210.00)	0.003	
Worry about the current COVID-19 situation (ref=Not at all worried)										
A little worried	0.10	0.69	1.11 (0.83, 1.47)	0.491	<0.001	−0.16	−0.25	0.85 (0.23, 3.12)	0.806	0.026
Moderately worried	0.33	2.30	1.39 (1.05, 1.85)	0.021		−0.10	−0.16	0.90 (0.26, 3.11)	0.870	
Very worried	0.46	3.14	1.59 (1.19, 2.12)	0.002		0.70	1.07	2.02 (0.56, 7.34)	0.284	
Extremely worried	0.53	3.35	1.71 (1.25, 2.33)	<0.001		1.20	1.57	3.31 (0.74, 14.77)	0.116	
Concern about getting or having COVID-19 (ref=Not at all)										
Somewhat	−0.02	−0.32	0.98 (0.87, 1.11)	0.752	0.115	0.20	0.63	1.22 (0.65, 2.29)	0.532	0.075
Very much	0.15	1.61	1.17 (0.97, 1.41)	0.107		1.12	2.22	3.06 (1.14, 8.21)	0.026	
	Comparison with intercept-only model: Joint Wald test statistic=708.78, chi-squared df=16, p=<0.001					Comparison with intercept-only model: Likelihood ratio test statistic=131.90, chi-squared df=16, p=<0.001				

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[a] Model N=727 students, multivariable log-linear regression with robust standard errors

[b] Model N=550 students with GAD-7 below 8 on pre-pandemic (December 2019) survey, multivariable logistic regression

Note: Both models controlled for study intervention assignment (treatment/control), which was not significant in either model.