

Longitudinal effects of COVID-19-related stressors on young adults' mental health and wellbeing

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Abstract

The COVID-19 pandemic has presented young adults with novel challenges and disruptions to several life domains. The current study examined how COVID-19-related stressors (i.e., job-related, financial-related, social/relational, and illness-related stressors) relate to young adults' symptoms of depression and anxiety, and satisfaction with life (in the US). In Aim 1, we examined associations between COVID-19-related stressors and indices of mental health and well-being in the initial phase of the pandemic (April/May 2020) while accounting for participants' pre-pandemic levels of these outcomes in January of 2020 ($N = 519$; $M_{\text{age}} = 25.4$; 62.8% women). Social/relational stressors were most strongly associated with increased symptoms of anxiety/depression, and financial stressors were most strongly associated with decreased satisfaction with life. Extending this research longitudinally (Aim 2), we sampled young adults bi-monthly across a year-long period (September 2020 to August 2021). Multilevel models revealed within-person associations between each stressor domain and mental health/well-being; young adults reported more symptoms of depression/anxiety and lower satisfaction with life in months that stressors were relatively more salient.

Interactions between stressors and time revealed associations were generally stronger in earlier months and decreased linearly across the pandemic. Taken together, longitudinal evidence indicates that COVID-19-related stressors, especially social/relational stressors, have direct and time-varying associations with mental health and well-being.

KEYWORDS

anxiety, depression, emerging adulthood, SARS-CoV-2, satisfaction with life

INTRODUCTION

Young adulthood (i.e., ages 18–30) is a developmental period characterized by transitioning social roles in numerous life domains including career development, establishing financial independence, and building social and romantic relationships (Roisman et al., 2004). As highlighted by the theory of emerging adulthood (Arnett, 2007), these life transitions are nevertheless associated with high levels of stress and mental health challenges (Lane et al., 2017; Patrick et al., 2020; Schulenberg et al., 2005). Indeed, young adults have the highest prevalence of meeting diagnostic criteria for a past year mental health illness, compared with other age groups (SAMSHA, 2018). This high prevalence is in part because many young adults have not yet developed adaptive and effective strategies for coping with developmental life stressors (Mahmoud et al., 2012), and the pressures to reach key milestones can have negative impacts on young adults' life satisfaction (Newman & Newman, 2008). Given that young adults are highly vulnerable to life stressors, the mental health and well-being¹ of this age group are a salient concern during the COVID-19 pandemic, which has been a highly distressing time with detrimental impacts on multiple domains of daily life.

Alongside direct health concerns pertaining to the SARS-Cov-2 virus, the stressors and life disruptions associated with the COVID-19 pandemic raise salient concerns for young adults' mental health and well-being (Graupensperger et al., 2021). Life disruptions associated with the COVID-19 pandemic, including potential loss of employment, financial instability, and limited social interactions, have disproportionately affected young adults. For example, unemployment for US young adults rose from 8.0% in February 2020 to 25.3% in May 2020—higher than any other age group (Kochnar, 2020). Similarly, feelings of loneliness during COVID-19 are most prevalent among young adults (Lee et al., 2020; Luchetti et al., 2020). A study by Harvard's Making Caring Common research group reported that 61% of US young adults reported frequent feelings of loneliness (i.e., much higher than other age groups) and 43% reported increases in loneliness since the beginning of the COVID-19 pandemic (Weissbourd et al., 2021). The limited opportunities for social contact has indeed been a major challenge for young adults, with one study showing that college students who reported less social support and connectedness with their pre-existing peer groups during the pandemic reported lower well-being and more symptoms of depression (Graupensperger et al., 2020).

The disparities in COVID-19-related impacts on these critical life domains for young adults may have salient impacts on mental health and well-being. Notably, the theory of role overload (i.e., transitions overload model; Schulenberg et al., 2005) provides a developmental-contextual perspective: Increased instability and stress regarding young adults' transitions into normative adult roles, such as the stressors surrounding the COVID-19 pandemic, can overwhelm individuals' ability to cope and increase mental health concerns (e.g., Patrick et al., 2020). The transitions overload model also draws upon Coleman's focal theory (Coleman, 1989) and cumulative stress theory (Simmons et al., 1987) which, taken all together, hold that young people generally lack the ability to navigate multiple stressors at once, and the accumulation of multiple stressors decreases one's overall well-being.

Studies have begun to support theorized adverse effects of life stressors on mental health and well-being, specific to COVID-19. Income loss and financial strain have been found to be key predictors of both anxiety and depression symptoms during the COVID-19 pandemic, though authors concluded that these effects were most salient on depression (Hertz-Palmor et al., 2021). Another study found that the link between COVID-19-related financial instability and mental health symptoms was most pronounced among adults with lower assets (i.e., household incomes below \$45,000, household savings below \$5,000, non-homeowners, non-college degree, and being unmarried), which is a category that young adults are most likely to fall into (Ettman et al., 2021). Pertaining to social factors, loneliness during the COVID-19 pandemic has been identified as a key risk factor for depression symptoms, anxiety symptoms, and comorbidity of both symptoms (Palgi et al., 2020). Among college students, stressors pertaining to job insecurity and financial instability were associated with poorer subjective mental health, but when entered simultaneously into a model alongside other stressors, social and relational stressors were revealed to be the strongest predictor of depression and anxiety symptoms (Graupensperger et al., 2021). Illness-related stressors pertaining to fear of the virus itself have also been associated with mental health indices. In a nationally representative US sample, COVID-19 fears were strongly associated with symptoms of both depression and anxiety (Fitzpatrick et al., 2020).

The emerging literature examining COVID-19-related stressors and young adults' mental health and well-being has shown a clear adverse association. However, many of these published studies have been limited to cross-sectional designs that are unable to factor in young adults' mental health and well-being prior to the COVID-19 pandemic. As such, there is a need to examine the impact of COVID-19-related stressors on within-person changes in indices of mental health and well-being during the pandemic, relative to participants' pre-pandemic reports of these indices. Alongside examining within-person changes from pre-pandemic to during the pandemic, there is a need to longitudinally examine the effects of COVID-19-related stressors on mental health and well-being throughout the course of the pandemic. This is an important step as longitudinal designs can disentangle between-person effects (i.e., person average scores across time) from within-person effects that estimate how fluctuations in COVID-19-related stressors may be associated with variability in mental health and well-being.

Longitudinal data obtained throughout the COVID-19 pandemic can also be used to examine time-specific trends in stressors and mental health. Specifically, there is a need to examine whether associations between COVID-19-related stressors and indices of mental health and well-being are moderated by time (i.e., do associations vary in strength across time?). Given the novelty of pandemic-related stressors and the gradual reduction in government mandates/policies, COVID-19-related stressors may have had a more salient effect on young adults' mental health and well-being at earlier phases of the pandemic. Young adults may have been able

to develop effective coping methods as the pandemic progressed, thus limiting the negative effects of these stressors over time. For example, young adults may be settling into the “new-normal” lifestyle (Corpuz, 2021), which may alleviate the adverse impacts of life stressors on mental health; however, this question remains untested to our knowledge.

CURRENT STUDY

Although the full scope of how the COVID-19 pandemic has impacted young adults' developmental trajectories, mental health, and overall well-being may not be known for years to come, the current study uses longitudinal data to begin assessing longer-term associations between COVID-19-related life stressors and mental health symptoms. Consistent with emerging research on the effects of COVID-19 related stressors, we examine several distinct life domains: (a) job insecurity stressors pertaining to the loss of one's employment or reduction in hours and related benefits, (b) social/relational stressors related to feelings of isolation or strains on one's social life, (c) financial stressors such as not being able to afford rent or food, and (d) illness-related stressors specific to fear of being infected with COVID-19.

The current study entails a longitudinal cohort design in which data were collected (a) pre-pandemic in January of 2020, (b) during the acute early phases of the pandemic in April/May of 2020, and (c) six monthly follow-ups spanning September/October 2020 through July/August 2021, assessed every other month. The present study will add to the understanding of how the initial impact of the pandemic caused concern or stress in various developmental domains and the extent those were associated with changes in mental health. Further, as the impact of the pandemic continued into the subsequent year (i.e., 2021), examining the proximal influence of stressors on mental health indices in terms of month-to-month variability is important to identify the extent that associations occur at the between- and within-person levels. Both aims have important implications for when to implement interventions and identifying which stressors may be most salient to focus prevention efforts.

The first aim was to examine associations between COVID-19-related stressors (i.e., job insecurity, social/relational, financial, and illness-related) and *changes* in depression symptoms, anxiety symptoms, and satisfaction with life from January of 2020 (pre-pandemic) to April/May of 2020 (early pandemic). This aim builds on a growing literature showing spikes in mental health concerns among young adults during 2020, relative to previous years (e.g., Brailovskaia et al., 2021), by identifying predictors/correlates of these changes at the within-person level.

Hypothesis H1. We generally hypothesized that greater reported life stressors would be associated with increased symptoms of depression and anxiety, and decreased satisfaction with life. Based on prior research on this topic (Graupensperger et al., 2021) and the importance of peers and relationships during young adulthood (Arnett, 2007), we anticipated that social/relational stressors would have the most salient effects on young adults' mental health and well-being.

The second aim used longitudinal bi-monthly surveys throughout the first year and a half of the COVID-19 pandemic to (a) estimate within-person associations between life stressors and mental health/well-being and (b) test whether the strength of these associations varied over time.

Hypothesis H2. We hypothesized that young adults would report poorer mental health and well-being in months they reported greater perceived life stressors.

Hypothesis H3. Although it has not been addressed by prior research, to our knowledge, we anticipated that the strength of associations between life stressors and mental health and well-being would decrease with time as the pandemic progressed (i.e., the effects would be significantly moderated by time).

METHOD

Participants and procedures

The present study was conducted with participants from an ongoing longitudinal cohort study (in the US) on young adult role transitions (BLINDED). This project originally enrolled a community sample of 767 young adults on a rolling basis between February 2015 and January 2016 to complete monthly surveys for 24 months, with an additional 30-month follow-up (participants were enrolled on a rolling basis). Inclusion criteria into the original longitudinal study entailed being between the ages of 18–23 at screening (i.e., in 2015/2016), drinking at least one alcoholic beverage in the past year, and living within 60 miles of the study office in Seattle, WA. In January of 2020, participants from the original cohort were invited to participate in an additional follow-up survey ($N = 594$ opted-in to the January follow-up; 77.4% response rate of the original cohort). Participants provided informed consent at each survey timepoint, and all aspects of this research received institutional review approval from the lead author's university. No adverse events were reported.

Aim 1 analytic sample

To examine young adults' health and well-being during the early stages of the COVID-19 pandemic, we invited participants from the original cohort to complete an additional follow-up survey in April and May of 2020 ($N = 552$ opted-in to the April/May follow-up; 72.0% response rate). In total, 519 participants had at least partial responses to both the January and April/May surveys, which is the analytic sample for Aim 1, examining changes in mental health and well-being from pre-pandemic to the early acute phase of the pandemic. This sample comprised 62.8% women and was between the ages of 22 and 29 ($M_{\text{age}} = 25.4$ years; $SD = 1.84$). Pertaining to race/ethnicity, 54.6% identified as White/Caucasian, 19.5% identified as Asian/Asian American, 4.3% identified as Black/African American, 8.3% identified as Hispanic, and 13.4% identified as Other or multiple race/ethnicities. Most of the sample (72.7%) had a bachelor's degree or higher, 10.8% reported currently working towards a 4-year degree, and 93.4% reported having some form of employment. Participation was incentivized by a \$15 gift card at each of the two timepoints.

Aim 2 analytic sample

When it became evident that the COVID-19 pandemic was going to be a long-term and ongoing disruption in the lives of young adults, we initiated a longitudinal study (with the original

cohort) in which participants were surveyed bi-monthly for a 12-month period. Half of the participants were randomized to begin in September of 2020, and the other half to begin in October of 2020. Of the original cohort, 566 young adults opted-in to the longitudinal portion of this study (73.8%), which comprised the analytic sample for Aim 2. The demographics for this sample were very similar to the analytic sample for Aim 1 but differed slightly. The Aim 2 analytic sample comprised 61.8% women ($M_{\text{age}} = 25.8$ years; $SD = 1.83$), and 54.6% identified as White/Caucasian, 18.4% identified as Asian/Asian American, 5.0% identified as Black/African American, 8.5% identified as Hispanic, and 13.5% identified as Other or multiple race/ethnicities. Pertaining to educational attainment reported in the first bi-monthly wave, 74.6% had a bachelor's degree or higher, and 5.7% reported currently working towards a 4-year degree. Most participants (i.e., 90.9%) reported having some form of employment. Participation was incentivized by a \$15 gift card at each timepoint.

Measures

COVID-19-related stressors

To examine stressors in multiple life domains, we used the Multifaceted COVID-19-Related Stressors Scale to ask young adults about stressors pertaining to job insecurities, social/relational stressors, financial stressors, and illness-related stressors directly related to the SARS-CoV-2 virus (Graupensperger et al., 2021). The stem for these stressors items was “The questions in this scale ask you about your feelings and thoughts at this time during the COVID-19 pandemic. How concerned are you about the novel coronavirus (COVID-19)” Response ranges from 1 = *Not at all* to 5 = *Extremely*.

This scale was initially developed in a college student sample and had an additional school-related stressors subscale. Confirmatory factor analysis was conducted to examine the fit of the current data to the original 5-factor COVID-related stressors model reported by Graupensperger et al. (2021). Given the low number of college students in our sample, we compared the fit of this factor structure to a 4-factor model that removed the school stressors items. The 4-factor model (removing school stressors) was a significantly better fit to the data ($\chi^2 = 53.90$, $p < .001$); thus, we currently use the 4-factor model to assess COVID-19-related stressors pertaining to job-related stressors, social stressors, financial stressors, and illness-related stressors. This 4-factor model adequately fit the data: Comparative Fit Index = .92, Tucker-Lewis Index = .89, Root Mean Square Error of Approximation = .09, and Standardized Root Mean Square Residual = .06. Reliability of the stressors subscales in April/May of 2020 ranged from $\alpha = .70$ (social/relational) to $\alpha = .85$ (job insecurity) and ranged from $\alpha = .71$ (social/relational) to $\alpha = .89$ (job insecurity) in the bi-monthly longitudinal surveys.

Mental health and well-being

Satisfaction with life was assessed at each timepoint with the five-item Satisfaction with Life Scale (Diener et al., 1985). Using a 7-point scale ranging from 1 = *Strongly Disagree* to 7 = *Strongly Agree*, participants rated their agreement with each item (e.g., “*The conditions of my life are excellent*”). The five items are summed to create a total score, and the scale had high reliability at each timepoint (Cronbach's α ranged .90 to .92).

Symptoms of depression were assessed using the two- or eight-item Patient Health Questionnaire (PHQ)² at each timepoint; the PHQ-2 short scale (Kroenke et al., 2009) was used for surveys in January and April/May of 2020, while the PHQ-8 (Kroenke et al., 2001) was used in the bi-monthly longitudinal surveys and excluded the item assessing suicidal ideation/self-harm. The two items included for Aim 1 are “Little interest or pleasure in doing things” and “Feeling down, depressed, or hopeless,” and response options ranged from 0 = *Not at all* to 3 = *Nearly every day*. Spearman-Brown reliability estimates were $\alpha = .88$ and $\alpha = .86$ for the PHQ-2 in January and April/May, respectively, and Cronbach's α ranged between $\alpha = .90$ and $\alpha = .91$ for the PHQ-8 in the bi-monthly longitudinal surveys.

Symptoms of anxiety were assessed using the Generalized Anxiety Disorder Scale (GAD). The shortened GAD-2 (Kroenke et al., 2009) was used in January and April/May of 2020, and the full GAD-7 (Spitzer et al., 2006) was used for the bi-monthly longitudinal surveys. The two items included in Aim 1 are “Feeling nervous, anxious, or on edge” and “Not being able to stop or control worrying” and response options ranged from 0 = *Not at all* to 3 = *Nearly every day*. Items were summed within each subscale and Spearman-Brown reliability estimates were $\alpha = .88$ and $\alpha = .89$ for the GAD-2 in January and April/May, respectively, and Cronbach's α ranged between $\alpha = .92$ and $\alpha = .93$ for the GAD-7 in the bi-monthly surveys.

Analyses

Aim 1

In an initial step, paired samples *t* tests compared January 2020 (pre-pandemic) scores on mental health and well-being to scores reported in the early stages of the COVID-19 pandemic (April/May of 2020). The estimates indicate, on average, how indices of mental health and well-being shifted, relative to pre-pandemic. The primary analyses for Aim 1 entailed multiple regression models examining associations between the four life stressors and depression symptoms, anxiety symptoms, and satisfaction with life in April/May of 2020. Notably, these models included January 2020 scores on the outcome variable as covariates, which enables us to interpret the effects as *change* in these indices relative to pre-pandemic. Thus, estimated coefficients indicate participants' increase/decrease in the outcome variable, relative to scores in January of 2020. Models also controlled for birth sex, age, and race/ethnicity.

Aim 2

To examine whether fluctuations in stressors across the bi-monthly surveys were associated within-persons with the three indicators of mental health, linear mixed effects models were estimated with restricted maximum likelihood estimation using the lme4 package (Bates et al., 2015) of R 4.1.0 (R CoreTeam, 2021). All models included a random intercept, and random slopes were included for all Level 1 stressor subscales which allowed the magnitude of the associations between the stressor subscales and outcome variables to vary across participants. To appropriately disentangle within- and between-person associations at Levels 1 and 2, respectively, the Level-1 stressor subscale variables were person-mean-centered, and a linear time variable was included in all models (Hamaker & Muthén, 2020; Wang & Maxwell, 2015).

A three-step model-building approach was taken for this aim. First, each stressor subscale was included in its own model so associations with outcome variables could be tested without concern for variance shared with other subscales or potential multicollinearity. Second, an interaction with time was added to these models to test whether the strength of associations between each stressor subscale and outcome varied across the six bi-monthly surveys. Lastly, all four stressor subscales were included as predictors in a single model (without time interactions) to assess whether particular stressor subscales exhibited unique associations with mental health outcomes, while controlling for the other stressor subscales.

RESULTS

Preliminary analyses

We first examined correlates of participation to identify whether mental health and well-being scores in January of 2020 were related to whether participants opted-in to the initial COVID-19 survey in April/May of 2020 or the bi-monthly longitudinal surveys. There was no association between April/May participation and pre-pandemic symptoms of depression ($r = -.03$, $p = 0.46$) or anxiety ($r = .00$, $p = 0.97$); however, those who reported greater satisfaction with life prior to the pandemic were slightly more likely to opt-into the April/May follow-up survey ($r = .10$, $p = 0.01$). Pre-pandemic scores on depression symptoms ($r = -.02$, $p = 0.57$), anxiety symptoms ($r = -.01$, $p = 0.73$), and satisfaction with life ($r = .02$, $p = 0.58$) were all unrelated to participation in the bi-monthly longitudinal surveys.

Aim 1: Associations between life stressors and changes in mental health and well-being

Examining mean scores on indices of mental health and well-being at pre-pandemic (January 2020) and early-pandemic (April/May 2020) timepoints, symptoms of depression had increased significantly and satisfaction with life had decreased significantly, on average (see Table 1). In the early-pandemic survey (April/May 2020), the sample, on average, reported the highest levels of illness-related stressors ($M = 2.94$, $SD = 0.97$), followed by social/relational stressors ($M = 2.75$, $SD = 1.02$), job stressors ($M = 2.13$, $SD = 1.18$), and financial stressors ($M = 2.12$,

TABLE 1 Sample means for depression symptoms, anxiety symptoms, and satisfaction with life prior to COVID-19 (T1) and during the initial phase of the COVID-19 pandemic (T2)

	T1: January 2020			T2: April/May 2020			Paired-samples <i>t</i> test	
	Mean	SD	Range	Mean	SD	Range	<i>t</i> value	<i>p</i> value
Depression symptoms (PHQ)	1.64	1.67	0–6	1.85	1.61	0–6	2.86	.004
Anxiety symptoms (GAD)	2.13	1.76	0–6	2.06	1.78	0–6	–0.91	.360
Satisfaction with life	23.65	7.30	5–35	23.02	7.05	5–35	–2.33	.020

Note: $N = 519$ young adults.

$SD = 1.06$), scored 1–5. Pertaining to life stressors, social/relational stressors were significantly related to increased symptoms of depression in the early stages of the COVID-19 pandemic (Table 2). Financial- and illness-related stressors were significantly associated with increased symptoms of anxiety, but social/relational stressors were most strongly associated. Pertaining to satisfaction with life, both social/relational and financial-related stressors were associated with decreased satisfaction with life, and financial-related stressors were most strongly related. Job stressors were not associated with changes in any of the mental health dimensions.

Aim 2: Longitudinal associations between life stressors and mental health and well-being

Symptoms of depression

Results of linear mixed effects models testing within- and between-person associations between stressor subscales with symptoms of depression across the six bi-monthly surveys completed between September/October 2020 and July/August 2021 are presented in Table 3. The intraclass correlation coefficient for the PHQ outcome was .76, which indicated that 76% of the variability in PHQ scores was between-persons. In separate models testing whether each of the four stressors were associated with depression symptom severity, there were positive, statistically significant within- and between-person associations between all four stressor subscales and PHQ scores. Within-persons, this indicated that in months participants reported relatively higher levels of perceived COVID-19-related stressors in each domain they tended to experience

TABLE 2 Associations between COVID-19-related stressors and indices of mental health and well-being during the initial phase of the COVID-19 pandemic, controlling for pre-pandemic levels of these outcomes

	Depression symptoms (PHQ)		Anxiety symptoms (GAD)		Satisfaction with life	
	β (SE)	<i>p</i> value	β (SE)	<i>p</i> value	β (SE)	<i>p</i> value
January 2020 Score on Outcome	0.43 (.04)	<.001	0.46 (0.04)	<.001	0.58 (0.03)	<.001
Birth sex (0 = female; 1 = male)	−0.21 (.13)	.093	−0.54 (0.13)	<.001	−0.53 (0.49)	.277
Age	0.05 (.03)	.154	0.02 (0.03)	.620	0.10 (0.13)	.427
Race (White = reference)						
Asian/Asian American	−0.42 (.16)	.009	−0.45 (0.17)	.007	0.11 (0.63)	.860
Hispanic/Latinx	−0.34 (.22)	.120	−0.22 (0.23)	.333	0.35 (0.85)	.681
Other race ethnicity	−0.33 (.16)	.045	0.34 (0.19)	.070	−0.85 (0.64)	.187
Job-related stressors	0.07 (.07)	.349	−0.09 (0.07)	.238	0.00 (0.27)	.988
Social/relational-related stressors	0.44 (.06)	<.001	0.28 (0.07)	<.001	−0.89 (0.25)	<.001
Financial-related stressors	0.01 (.08)	.834	0.18 (0.09)	.043	−1.18 (0.32)	<.001
Illness-related stressors	0.10 (.07)	.124	0.27 (0.07)	<.001	−0.13 (0.26)	.628

Note: $N = 519$ young adults.

TABLE 3 Multilevel models testing associations between COVID-19-related stressors and symptoms of depression across the first year-and-a-half of the COVID-19 pandemic

Outcome: Patient Health Questionnaire (PHQ-8)										
	Model 1.1: Job-related stressors only		Model 1.2: Social/relational stressors only		Model 1.3: Financial stressors only		Model 1.4: Illness-related stressors only		Model 1.5: Full model	
	β	SE	β	SE	β	SE	β	SE	β	SE
Level 2 (person level)										
Intercept	6.77 ^{***}	.20	6.70 ^{***}	.19	6.83 ^{***}	.20	6.75 ^{***}	.20	6.84 ^{***}	.19
Mean job-related stress	1.03 ^{***}	.22	-	-	-	-	-	-	-1.05 ^{***}	.32
Mean social stress	-	-	2.21 ^{***}	.21	-	-	-	-	1.74 ^{***}	.25
Mean financial stress	-	-	-	-	1.81 ^{***}	.21	-	-	1.86 ^{***}	.34
Mean illness-related stress	-	-	-	-	-	-	1.52 ^{***}	.25	.01	.27
Birth sex (0 = female; 1 = male)	-2.08 ^{***}	.40	-1.60 ^{***}	.37	-2.17 ^{***}	.38	-1.73 ^{***}	.40	-1.80 ^{***}	.37
Age	-.06	.11	-.09	.10	-.04	.10	-.12	.10	-.08	.09
Race/ethnicity										
White NH (ref.)	-	-	-	-	-	-	-	-	-	-
Asian NH	-.87	.52	-.25	.48	-.70	.50	-.78	.51	-.35	.47
Other NH	-.18	.52	.03	.48	-.42	.50	-.10	.51	-.19	.47
Hispanic	.99	.72	1.07	.66	1.13	.69	.99	.70	1.07	.64
Level 1 (month level)										
Time	.02	.01	.04 ^{**}	.01	.01	.01	.03	.01	.01	.02
Job-related stress	.37 ^{**}	.12	-	-	-	-	-	-	-.03	.16
Social stress	-	-	1.29 ^{***}	.11	-	-	-	-	1.11 ^{***}	.12
Financial stress	-	-	-	-	.87 ^{***}	.15	-	-	.32	.17
Illness-related stress	-	-	-	-	-	-	.74 ^{***}	.13	.05	.14

(Continues)

TABLE 3 (Continued)

Outcome: Patient Health Questionnaire (PHQ-8)											
Model 1.1: Job-related stressors only		Model 1.2: Social/relational stressors only		Model 1.3: Financial stressors only		Model 1.4: Illness-related stressors only		Model 1.5: Full model			
β	SE	β	SE	β	SE	β	SE	β	SE		
Interactions with time (from separate models)											
Job-related stress \times time	-.06*	.03	-	-	-	-	-	-	-	-	-
Social stress \times time	-	-	-.12***	.02	-	-	-	-	-	-	-
Financial stress \times time	-	-	-	-	-.15***	.03	-	-	-	-	-
Illness-related stress \times time	-	-	-	-	-	-	-.06*	.03	-	-	-

Note: $N_{\text{surveys}} = 3,861$ – $3,932$, $N_{\text{persons}} = 557$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

greater symptoms of depression. Between-persons, this indicated that participants who reported higher average stressor levels in each domain across the six bi-monthly surveys tended to report greater average symptoms of depression.

Another set of models testing whether the linear effect of time moderated the within-person association between each stressor subscale and depression symptom severity revealed that time moderated this association for each stressor subscale such that the strength of the associations between COVID-related stressors and depression symptom severity tended to be weaker in later months relative to earlier months. Finally, when including all stressor subscales as predictors in the same model, perceived social stress was the only significant within-person predictor of depression symptom severity. Put another way, there was a unique, positive, within-person association between social stressors and depression symptom severity such that in months, participants reported higher levels of social stress they tended to report higher levels of depression symptom severity, while controlling for job, financial, and illness-related stress. Between-persons, average levels of social and financial stress were uniquely positively associated with average symptoms of depression across the bimonthly surveys, and average job-related stress was uniquely negatively associated with average depression symptom severity.

Symptoms of anxiety

Results of models testing associations between stressor subscales and symptoms of anxiety are presented in Table 4. The intraclass correlation coefficient for GAD-7 scores was .75, which indicated that 75% of the variability in GAD scores was between-persons. In separate models testing whether each of the four stressor subscales was associated with symptoms of anxiety, there were positive, statistically significant within- and between-person associations between job, social, and financial stressors and symptoms of anxiety. The within-person association between illness-related stressors and anxiety symptom severity was non-significant, but there was a significant positive between-person association between illness-related stressors and anxiety symptom severity. Within-persons, this indicated that in months participants reported higher levels of COVID-related stress in the job, social, and financial domains they tended to experience greater symptoms of anxiety. Between-persons, this indicated that participants who reported higher average stressor levels in each domain across the six bi-monthly surveys also tended to report greater symptoms of anxiety.

Another set of models testing whether the linear effect of time moderated the within-person association between each stressor subscale and symptoms of anxiety revealed that time moderated the associations between job and financial stressors and symptoms of anxiety, though it had opposite moderating effects on each. The association between job-related stress and anxiety tended to be weaker in later months relative to earlier months, whereas the association between financial stress and anxiety tended to be stronger in later months. Finally, when including all stressor subscales as predictors in the same model, perceived social and illness-related stress was the only significant within-person predictors of symptoms of anxiety. Put another way, social and illness-related stress were uniquely associated with symptoms of anxiety, while controlling for other stressors. In months, participants reported higher levels of social stress they tended to report *higher* levels of anxiety, whereas in months, they reported higher levels of illness-related stress they tended to report *lower* levels of anxiety symptom severity. Between-persons, average levels of social and financial stress were positively associated with average

TABLE 4 Multilevel models testing associations between COVID-19-related stressors and symptoms of anxiety across the first year-and-a-half of the COVID-19 pandemic

Outcome: Generalized Anxiety Disorder Screener (GAD-7)											
	Model 1.1: Job-related stressors only		Model 1.2: Social/relational stressors only		Model 1.3: Financial stressors only		Model 1.4: Illness-related stressors only		Model 1.5: Full model		
	β	SE	β	SE	β	SE	β	SE	β	SE	
Level 2 (person level)											
Intercept	6.11 ^{***}	.18	6.07 ^{***}	.18	6.04 ^{***}	.18	6.23 ^{***}	.19	6.05 ^{***}	.17	
Mean job-related stress	1.25 ^{***}	.20	-	-	-	-	-	-	-.48	.29	
Mean social stress	-	-	2.07 ^{***}	.19	-	-	-	-	1.56 ^{***}	.23	
Mean financial stress	-	-	-	-	1.81 ^{***}	.19	-	-	1.41 ^{***}	.31	
Mean illness-related stress	-	-	-	-	-	-	1.61 ^{***}	.22	.19	.25	
Birth sex (0 = female; 1 = male)	-2.28 ^{***}	.36	-1.84 ^{***}	.34	-2.37 ^{***}	.35	-1.90 ^{***}	.36	-1.98 ^{***}	.34	
Age	-.07	.09	-.11	.09	-.06	.09	-.13	.09	-.09	.09	
Race/ethnicity											
White NH (ref.)	-	-	-	-	-	-	-	-	-	-	
Asian NH	-1.30 ^{**}	.48	-.72	.44	-1.19 ^{**}	.45	-1.22 ^{**}	.47	-.93 [*]	.44	
Other NH	-.10	.47	.10	.44	-.32	.46	-.06	.47	-.13	.43	
Hispanic	.13	.65	.09	.61	.16	.63	.10	.64	.09	.59	
Level 1 (month level)											
Time	-.07 ^{***}	.01	-.06 ^{***}	.01	-.05 ^{***}	.01	-.09 ^{***}	.01	-.05 ^{***}	.01	
Job-related stress	.24 [*]	.12	-	-	-	-	-	-	.02	.15	
Social stress	-	-	.93 ^{***}	.11	-	-	-	-	.98 ^{***}	.13	
Financial stress	-	-	-	-	.50 ^{***}	.14	-	-	.19	.16	
Illness-related stress	-	-	-	-	-	-	.17	.12	-.27 [*]	.13	

TABLE 4 (Continued)

Outcome: Generalized Anxiety Disorder Screener (GAD-7)														
Model 1.1: Job-related stressors only			Model 1.2: Social/relational stressors only			Model 1.3: Financial stressors only			Model 1.4: Illness-related stressors only			Model 1.5: Full model		
β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	
Interactions with time (from separate models)														
		-.06*	.03	-	-	-	-	-	-	-	-	-	-	
Job-related stress \times time														
		-		.02	.02	-		-		-		-		
Social stress \times time														
		-		-		.06*	.03	-		-		-		
Financial stress \times time														
		-		-		-		-		-.04	.03	-		
Illness-related stress \times time														

Note: $N_{\text{surveys}} = 3,857-3,928, N_{\text{persons}} = 556-557.$

* $p < .05.$

** $p < .01.$

*** $p < .001.$

TABLE 5 Multilevel models testing associations between COVID-19-related stressors and satisfaction with life across the first year-and-a-half of the COVID-19 pandemic

Outcome: The satisfaction with life scale										
	Model 1.1: Job-related stressors only		Model 1.2: Social/relational stressors only		Model 1.3: Financial stressors only		Model 1.4: Illness-related stressors only		Model 1.5: Full model	
	β	SE	β	SE	β	SE	β	SE	β	SE
Level 2 (person level)										
Intercept	22.60 ^{***}	.28	22.68 ^{***}	.28	22.67 ^{***}	.27	22.28 ^{***}	.29	22.11 ^{***}	.27
Mean job-related stress	-1.65 ^{***}	.31	-	-	-	-	-	-	1.53 ^{***}	.46
Mean social stress	-	-	-2.54 ^{***}	.31	-	-	-	-	-1.69 ^{***}	.36
Mean financial stress	-	-	-	-	-2.82 ^{***}	.30	-	-	-3.43 ^{***}	.50
Mean illness-related stress	-	-	-	-	-	-	-1.72 ^{***}	.35	.30	.39
Birth sex (0 = female; 1 = male)	-.87	.56	-1.50 ^{**}	.55	-.78	.54	-1.24 [*]	.57	-1.00	.53
Age	-.03	.15	.04	.14	-.04	.14	.05	.15	< -.01	.14
Race/ethnicity										
White NH (ref.)	-	-	-	-	-	-	-	-	-	-
Asian NH	-1.48 [*]	.74	-2.10 ^{**}	.71	-1.54 [*]	.70	-1.60 [*]	.74	-2.09 ^{**}	.69
Other NH	-1.90 ^{**}	.73	-2.21 ^{**}	.71	-1.41 [*]	.70	-1.92 ^{**}	.74	-1.57 [*]	.68
Hispanic	-1.60	1.01	-1.60	.97	-1.64	.96	-1.43	1.01	-1.78	.93
Level 1 (month level)										
Time	-.09 ^{***}	.02	-.11 ^{***}	.02	-.11 ^{***}	.02	-.03	.02	.01	.02
Job-related stress	-.71 ^{***}	.16	-	-	-	-	-	-	-.23	.24
Social stress	-	-	-1.58 ^{***}	.13	-	-	-	-	-1.38 ^{***}	.15
Financial stress	-	-	-	-	-1.24 ^{***}	.19	-	-	-.21	.22
Illness-related stress	-	-	-	-	-	-	-.68 ^{***}	.15	.28	.18

TABLE 5 (Continued)

Outcome: The satisfaction with life scale											
Model 1.1: Job-related stressors only		Model 1.2: Social/relational stressors only		Model 1.3: Financial stressors only		Model 1.4: Illness-related stressors only		Model 1.5: Full model			
β	SE	β	SE	β	SE	β	SE	β	SE		
Interactions with time (from separate models)											
Job-related stress \times time	.03	.04	-	-	-	-	-	-	-	-	-
Social stress \times time	-	-	.41 ^{***}	.03	-	-	-	-	-	-	-
Financial stress \times time	-	-	-	-	.32 ^{***}	.04	-	-	-	-	-
Illness-related stress \times time	-	-	-	-	-	-	.24 ^{***}	.04	-	-	-

Note: $N_{\text{surveys}} = 3,853$ – $3,924$, $N_{\text{persons}} = 554$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

anxiety symptom severity across the bimonthly surveys, but average levels of job and illness-related stress were not associated with average anxiety symptom severity.

Satisfaction with life

Results of models testing associations between stressor subscales and satisfaction with life are shown in Table 5. The intraclass correlation coefficient for the satisfaction with life indicated that 78% of the variability in satisfaction with life scores was between-persons. In separate models testing whether each of the four stressors were associated with satisfaction with life, there were negative, statistically significant within- and between-person associations between all four stressor subscales and satisfaction with life scores. Within-persons, this indicated that in months participants reported higher levels of perceived COVID-19-related stressors in each domain, they tended to experience lower satisfaction with life. Between-persons, participants who reported higher average stressor levels across the six bi-monthly surveys tended to report lower average satisfaction with life throughout the study period.

The model testing whether the linear effect of time moderated the within-person association between each stressor subscale and satisfaction with life revealed that time moderated the associations between social, financial, and illness-related stressors and satisfaction with life such that the strength of the within-person associations between these COVID-related stressors and satisfaction with life tended to be weaker in later months relative to earlier months. Finally, when including all stressor subscales as predictors in the same model, perceived social stress was the only significant within-person predictor of satisfaction with life. Thus, social stressors predicted satisfaction with life when controlling for the effects of job, financial, and illness-related stressors on satisfaction with life such that in months participants reported higher levels of social stress they tended to report lower levels of satisfaction with life. Between-persons, average levels of social and financial stress were negatively associated with average life satisfaction across the bimonthly surveys, and average job-related stress was positively associated with average life satisfaction.

DISCUSSION

The COVID-19 pandemic has presented young adults with challenges and stressors that pertain to numerous life domains. Considering the emerging evidence that young adults have experienced concerning declines in mental health and well-being during the pandemic (e.g., Hawes et al., 2021), the current study examined the extent that indices of mental health and well-being were predicted by stressors in several life domains that are central to the developmental period of young adulthood. We found several significant associations between COVID-19- stressors and indices of mental health and well-being. Aim 1 included data collected both pre-pandemic (January of 2020) and during the initial acute phase of the pandemic (April/May of 2020) to examine intraindividual changes in mental health and well-being. Aim 2 employed a longitudinal repeated measures design collecting data bi-monthly across the first year and a half of the pandemic to disentangle within- and between-person effects and to examine whether associations between stressors and mental health/well-being decreased across time.

Specific to the first aim, social/relational stressors were a key predictor of depression symptoms, anxiety symptoms, and satisfaction with life in the early phases of the COVID-19 pandemic, while accounting for pre-pandemic levels of these outcomes. Moreover, financial and illness-related stressors predicted increased anxiety symptoms, and financial stressors strongly predicted decreased satisfaction with life. Findings generally indicated that changes in mental health/well-being indices from pre-pandemic to early-phase-pandemic were associated with increased stress in several life domains, with the most notable being social/relational stressors. It also extends our understanding of the initial effects of COVID-19-related stressors by examining a community sample of young adults, supporting hypotheses that social/relational stressors may be central to the widespread declines in mental health/well-being among young adults (Liu et al., 2020). The salient effects of social/relational stressors also highlight potential adverse implications of abrupt and strict lockdown policies (e.g., shelter in place) during a time when many young adults had not yet adapted to safe strategies for socializing.

From a developmental perspective, previous research has shown that young adults undergoing changes in life domains (e.g., starting or stopping education/work or changes in living situations) have elevated levels of perceived stress (Cadigan et al., 2021) and that experiencing multiple transitions at once, particularly ones that are viewed negatively, have heightened risk for mental health problems (Patrick et al., 2020). During this early phase of the pandemic, the major life disruptions on several domains of life all at once may have had a compounding or “domino” effect on young adults. Thus, evidence for how COVID-19-related stressors in specific developmental domains relates to young adults’ mental health not only demonstrates pernicious secondary health concerns related to the pandemic but also highlights vulnerabilities for young adults that may require greater prevention efforts going forward (e.g., plans to maintain supportive social network connections should we face similar lockdowns).

The second aim further examined associations between mental health/well-being and COVID-19-related stressors longitudinally across six bi-monthly follow-ups with the goal of examining both between- and within-person effects. Findings indicated that within-person increases (relative to participants’ mean-levels) in each specific stressor domain were related to increased symptoms of depression and anxiety and decreased satisfaction with life. That is, months when participants’ reported relatively higher levels of these domain-specific COVID-related stressors coincided with poorer mental health and well-being in that specific month. The lone exception was for illness-related stressors, which was not significantly associated at the within-person level with symptoms of anxiety, but was nevertheless strongly associated at the between-person level such that young adults with greater illness-related stress, on average, reported greater symptoms of anxiety. Subsequent models were fit to estimate the relative effects of each stressor while controlling for stressors in the other life domains. When estimated simultaneously, social/relational stressors again emerged as the central domain that was predictive of poorer mental health and well-being. However, an unexpected effect was found for illness-related stressors, which was inversely related to symptoms of anxiety in the full-model, but the effect was small and potentially due to suppression effects introduced when entering all four stressors as indicator variables into the same model.

The longitudinal results make an important novel contribution to this literature by demonstrating that intra-individual fluctuations in monthly stressors mapped onto mental health and well-being, at the within-person level, while existing studies to date have taken only between-person snapshots in time. This is a critical step in our understanding, given how volatile and rapidly changing the pandemic has been. Findings again support the relative

importance of the social and relational domain of young adults' lives; months when young adults felt more strain on their social lives and personal relationships were directly associated with poorer mental health and well-being. Importantly, all four COVID-19-related stressor domains showed general associations with mental health and well-being, which highlights the multifaceted framework for examining stressors in several life domains and enabled us to identify that social/relational stressors have the strongest relative effect on young adults' mental health and well-being.

This study also extended cross-sectional findings regarding the effects of illness-related stressors (i.e., COVID-19 fear) on mental health (see review Şmşir et al., 2021) by finding that illness-related stress had a between-person association (Aim 1 and 2) with anxiety symptoms, but *not* a within-person association (Aim 2). This may indicate that those who typically have greater anxiety symptoms felt more illness-related stress but that the illness-related stress did not have a time-varying effect on anxiety symptoms. Conversely, illness-related stress was not associated with increases in depression symptoms during the initial phase of the pandemic (Aim 1) but nevertheless demonstrated within-person effects in the longitudinal portion of the study whereby relative increases in illness-related stress were associated with greater levels of depression in a given month (Aim 2). This latter finding provides key evidence that fear of illness may elicit depression symptoms in young adults, which holds implications for psychological aspects of future contagious outbreaks or other illnesses.

Pertaining to both job-related and financial stressors, there were significant between- and within-person associations with all three indices of mental health and well-being (Aim 2). Given young adults are often less financially stable and at early career stages (Schulenberg et al., 2005), stressors in these domains are likely to elicit stronger internalizing symptoms compared to other age groups (Ettman et al., 2021; Hertz-Palmor et al., 2021). Findings may extend to other events that create widespread concern for job-loss or financial difficulties (e.g., economic downturns) with implications being that young adults are a vulnerable population that may need additional resources both direct (e.g., financial support) and indirect (e.g., mental health resources).

We also explored the effect of time (i.e., months since the start of the pandemic) in the multilevel models estimating associations between COVID-19-related stressors and mental health/well-being. First, we examined time as a covariate, which revealed an interesting main effect in which symptoms of anxiety, on average, decreased across the study period. Moreover, we examined time as a moderator of associations between stressors and mental health/well-being, which revealed several noteworthy patterns. Pertaining to symptoms of depression, the effects of each of the four stressors were significantly moderated by time, such that the strength of the associations *decreased* across the study period (i.e., September of 2020 to August of 2021). This was also true of the association between job-related stress and symptoms of anxiety (i.e., decreased association over time), but the opposite was true for the association between financial stressors and symptoms anxiety, which *increased* in strength across the study period. The models predicting satisfaction with life revealed significant time interactions with social/relational, financial, and illness-related stressors, such that the inverse associations decreased in strength across time. That is, the effect of these stressors on satisfaction with life became weaker in months further into the COVID-19 pandemic.

Ultimately, the findings regarding interactions with time reveal an optimistic perspective; COVID-19-related stressors are associated with poorer mental health and well-being, but the strength of these associations decreased linearly across a yearlong study period. This may provide support for theorizing that people may begin adapting to a “new normal” (Corpuz, 2021)

as the COVID-19 pandemic does not, to date, appear to be ending any time soon. Although COVID-19-related stressors may not be alleviating, the effect of these stressors is less salient on indices of mental health and well-being. This may also show indication that young adults have progressively developed strategies to cope with COVID-19-related stressors that were novel in the earlier months but may have become more routine over time.

Limitations

The current study answers a timely call to action for longitudinal studies on indices of mental health and well-being across the COVID-19 pandemic, but despite the strong design, several limitations require consideration. One limitation that pertains to the sample is that participants were originally recruited to a longitudinal cohort study from one metropolitan area of the US, and thus, findings do not necessarily generalize to other countries or even regions in the US (e.g., rural populations). Relatedly, the sample was representative of the region where data were collected, but nevertheless had minimal diversity for ethnic/racial minorities. This limited our ability to make inferences regarding disparities in mental health and well-being for marginalized demographics, which remains a central priority for public health research. Finally, some caution is warranted due to the self-report nature of this research.

CONCLUSIONS

The COVID-19 pandemic has proven to be a challenging time for young adults, who are in a vulnerable developmental period that is associated with elevated concerns for mental health. Findings from the current study provide longitudinal evidence that COVID-19-related stressors—particularly social/relational stressors—are directly associated with indices of mental health and satisfaction with life. Specifically, we found that relative to pre-pandemic levels of mental health and well-being, those who experienced greater COVID-19-related stressors in the initial phase of the pandemic reported greater increases in symptoms of anxiety and depression, as well greater decreases in satisfaction with life, relative to pre-pandemic levels of these indices (assessed in January 2020). Extending this research longitudinally, across the first year and a half of the pandemic, we found novel evidence of within-person associations indicating months when stressors were relatively salient young adults reported poorer mental health and well-being. However, we found that the strength of these associations has generally decreased over time, across the study period, as the COVID-19 pandemic may be becoming a “new normal.” Findings indicate the need to provide young adults with resources to cope with life stressors and to develop specific policies and strategies to negate the adverse effects of COVID-19 stressors on mental health and well-being.

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

ETHICS STATEMENT

All aspects of the study were approved by the Institutional Review Board at the University of Washington. No adverse events were reported.

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DATA AVAILABILITY STATEMENT

Data will be made available through the NIAAA Data Repository. Please contact the authors for data specific to the present study.

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ENDNOTES

- ¹ We use the term “mental health and well-being” as a combination term to be inclusive of a range of experiences. The focus of the current study is on depression symptoms, anxiety symptoms, and satisfaction with life, which are all key components of mental health and well-being (e.g., <https://www.cdc.gov/hrqol/wellbeing.htm>).
- ² The two-item short scales for the PHQ and GAD were used in Aim 1 as we did not anticipate the importance of studying depression/anxiety symptoms when preparing the pre-pandemic survey (January 2020). We opted to include the full PHQ-8 and GAD-7 when we launched the bi-monthly surveys (Aim 2) as mental health during the COVID-19 pandemic had become a central focus.

REFERENCES

- Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives*, 1, 68–73. <https://doi.org/10.1111/j.1750-8606.2007.00016.x>
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67, 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Brailovskaia, J., Teismann, T., Friedrich, S., Schneider, S., & Margraf, J. (2021). Suicide ideation during the COVID-19 outbreak in German university students: Comparison with pre-COVID 19 rates. *Journal of Affective Disorders Reports*, 6, 100228. <https://doi.org/10.1016/j.jadr.2021.100228>
- Cadigan, J. M., Fleming, C. B., Patrick, M. E., Lewis, M. A., Rhew, I. C., Abdallah, D. A., Fairlie, A. M., Schulenberg, J. E., Larimer, M. E., & Lee, C. M. (2021). Negative evaluation of role transitions is associated with perceived stress and alcohol consequences: Examination of the transitions overload model in young adulthood using two years of monthly data. *Alcoholism: Clinical and Experimental Research*, Ahead of Print, 45, 1607–1615. <https://doi.org/10.1111/acer.14636>
- Coleman, J. C. (1989). The focal theory of adolescence: A psychological perspective. In K. Hurrelmann & U. Engel (Eds.), *The social world of adolescents: International perspectives* (pp. 43–56). Walter De Gruyter.
- Corpuz, J. C. G. (2021). Adapting to the culture of “new normal”: An emerging response to COVID-19. *Journal of Public Health*, 43, e344–e345. <https://doi.org/10.1093/pubmed/fdab057>
- Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, 49, 71–75. <https://doi.org/10.4324/9781003035312-41>
- Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2021). Low assets and financial stressors associated with higher depression during COVID-19 in a nationally representative sample of

- US adults. *Journal of Epidemiology and Community Health*, 75, 501–508. <https://doi.org/10.1136/jech-2020-215213>
- Fitzpatrick, K. M., Harris, C., & Drawve, G. (2020). Fear of COVID-19 and the mental health consequences in America. *Clinical Infectious Diseases*, 12, 17–21.
- Graupensperger, S., Benson, A. J., Kilmer, J. R., & Evans, M. B. (2020). Social (un)distancing: Teammate interactions, athletic identity, and mental health of student-athletes during the COVID-19 pandemic. *Journal of Adolescent Health*, 67, 662–670. <https://doi.org/10.1016/j.jadohealth.2020.08.001>
- Graupensperger, S., Cadigan, J. M., Einberger, C., & Lee, C. M. (2021). *Multifaceted COVID-19-related stressors and associations with indices of mental health, well-being, and substance use among young adults* (pp. 1–14). International Journal of Mental Health and Addiction. <https://doi.org/10.1007/s11469-021-00604-0>
- Hamaker, E. L., & Muthén, B. (2020). The fixed versus random effects debate and how it relates to centering in multilevel modeling. *Psychological Methods*, 25, 365–379. <https://doi.org/10.1037/met0000239>
- Hawes, M. T., Szenczy, A. K., Klein, D. N., Hajcak, G., & Nelson, B. D. (2021). Increases in depression and anxiety symptoms in adolescents and young adults during the COVID-19 pandemic. *Psychological Medicine*, 13–21, 1–9. <https://doi.org/10.1017/S0033291720005358>
- Hertz-Palmor, N., Moore, T. M., Gothelf, D., DiDomenico, G. E., Dekel, I., Greenberg, D. M., Brown, L. A., Matalon, N., Visoki, E., White, L. K., Himes, M. M., Schwartz-Lifshitz, M., Gross, R., Gur, R. C., Gur, R. E., Pessach, I. M., & Barzilay, R. (2021). Association among income loss, financial strain and depressive symptoms during COVID-19: Evidence from two longitudinal studies. *Journal of Affective Disorders*, 291, 1–8. <https://doi.org/10.1016/j.jad.2021.04.054>
- Kochnar, R. (2020). Unemployment rose higher in three months of COVID-19 than it did in two years of the Great Recession. *Pew Research Center*, June 11, 2020.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity scale. *Journal of General Internal Medicine*, 16, 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: The PHQ-4. *Psychosomatics*, 50, 613–621. [https://doi.org/10.1016/S0033-3182\(09\)70864-3](https://doi.org/10.1016/S0033-3182(09)70864-3)
- Lane, J. A., Leibert, T. W., & Goka-Dubose, E. (2017). The impact of life transition on emerging adult attachment, social support, and well-being: A multiple-group comparison. *Journal of Counseling and Development*, 95, 378–388. <https://doi.org/10.1002/jcad.12153>
- Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health*, Ahead of Print, 67, 714–717. <https://doi.org/10.1016/j.jadohealth.2020.08.009>
- Liu, C. H., Zhang, E., Tin, G., Ba, W., Hyun, S., & Chris, H. (2020). Factors associated with depression, anxiety, and PTSD symptomatology during the COVID-19 pandemic: Clinical implications for U.S. young adult mental health. *Psychiatry Research*, 290, ahead of print. <https://doi.org/10.1016/j.psychres.2020.113172>
- Luchetti, M., Lee, J. H., Aschwanden, D., Sesker, A., Strickhouser, J. E., Terracciano, A., & Sutlin, A. R. (2020). The trajectory of loneliness in response to COVID-19. *American Psychologist*. Ahead of Print, 75, 897–908. <https://doi.org/10.1037/amp0000690>
- Mahmoud, J. S. R., Staten, R. T., Hall, L. A., & Lennie, T. A. (2012). The relationship among young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. *Issues in Mental Health Nursing*, 33, 149–156. <https://doi.org/10.3109/01612840.2011.632708>
- Newman, B. M., & Newman, P. R. (2008). *Development through life: A psychosocial approach*. Cengage Learning.
- Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., & Hoffman, Y. (2020). The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, 275, 109–111. <https://doi.org/10.1016/j.jad.2020.06.036>
- Patrick, M. E., Rhew, I. C., Duckworth, J. C., Lewis, M. A., Abdallah, D. A., & Lee, C. M. (2020). Patterns of young adult social roles transitions across 24 months and subsequent substance use and mental health. *Journal of Youth and Adolescence*, 49, 869–880. <https://doi.org/10.1007/s10964-019-01134-8>
- R CoreTeam. (2021). R: A language and environment for statistical computing. R Foundation for statistical computing, (4.0.3). R Foundation for Statistical Computing, Vienna, Austria. <https://www.r-project.org/>

- Roisman, G. I., Masten, A. S., Coatsworth, J. D., & Tellegen, A. (2004). Salient and emerging developmental tasks in the transition to adulthood. *Child Development, 75*, 123–133. <https://doi.org/10.1111/j.1467-8624.2004.00658.x>
- SAMSHA. (2018). Key substance use and mental health indicators in the United States: Results from the 2017 National Survey on Drug Use and Health (HHS Publication No. SMA 18-5068, NSDUH Series H-53). Substance Abuse and Mental Health Services Administration (SAMHSA). Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. <https://www.samhsa.gov/data>
- Schulenberg, J. E., O'Malley, P. M., Bachman, J. G., & Johnston, L. D. (2005). Early adult transitions and their relation to well-being and substance use. In F. Furstenberg, R. Rumbaut, & R. Settersten (Eds.), *On the frontier of adulthood*. University of Chicago Press.
- Simmons, R. G., Burgeson, R., Carlton-ford, S., Dale, A., Simmons, R. G., Burgeson, R., Carlton-ford, S., & Blyth, D. A. (1987). The impact of cumulative change in early adolescence. *Child Development, 58*, 1220–1234. <https://doi.org/10.2307/1130616>
- Şimsir, Z., Koç, H., Seki, T., & Griffiths, M. D. (2021). The relationship between fear of COVID-19 and mental health problems: A meta-analysis. *Death Studies, 1–9*, 1–9. <https://doi.org/10.1080/07481187.2021.1889097>
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*, 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>
- Wang, L. P., & Maxwell, S. E. (2015). On disaggregating between-person and within-person effects with longitudinal data using multilevel models. *Psychological Methods, 20*, 63–83. <https://doi.org/10.1037/met0000030>
- Weissbourd, R., Batanova, M., Lovison, V., & Torres, E. (2021). Loneliness in America: How the pandemic has deepened an epidemic of loneliness and what we can do about it. Harvard: Making Caring Common Project. <https://mcc.gse.harvard.edu/reports/loneliness-in-america>

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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