Mental Health and Well-Being Trends Through the First Year-and-a-Half of the COVID-19 Pandemic: Results from a Longitudinal Study of Young Adults in the USA

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Abstract

This study examined longitudinal trajectories of young adults' mental health and well-being before and throughout the first year-and-a-half of the COVID-19 pandemic. Repeated assessments of a young adult community cohort ($N = 656$; $M_{age} = 25.6$ years; 59.3% female) were conducted beginning prior to COVID-19 (January 2020) and extending through August 2021. Multilevel spline growth models estimated changes in three segments: (a) from pre-pandemic to April/May 2020, (b) from April/May 2020 to September 2020, and (c) from September 2020 to August 2021. Depression symptoms and loneliness increased significantly in the first segment, plateaued slightly, then decreased significantly across the final segment. Anxiety symptoms were unchanged across the first two segments, but significantly decreased in the final segment. Satisfaction with life decreased significantly across the first two segments, and then increased significantly in the final segment. Direct comparisons of pre-pandemic scores (January 2020) to the last follow-up (July or August 2021) showed a return to pre-pandemic levels of depression symptoms, loneliness, and satisfaction with life, as indicated by non-significant differences, and significantly *lower* anxiety symptoms, relative to pre-pandemic. Findings support concerns for young adults' mental health and well-being in the initial months of the COVID-19 pandemic, but also indicate that young adults' emotional well-being, on average, may be returning to pre-pandemic levels.

Keywords Depression · Anxiety · Loneliness · Satisfaction with Life · Spline growth models · Emerging adulthood

Since the beginning of the COVID-19 pandemic (i.e., March 2020), public health experts have raised concerns about the potential negative impacts on psychological well-being and mental health (Galea et al., 2020; Holmes et al., 2020; Pfefferbaum & North, 2020). Research from the first year of the COVID-19 pandemic generally showed that distress related to the pandemic and the stringent measures put in place to combat the spread of SARS-CoV-2 have had detrimental impacts on multiple domains of daily life (Graupensperger et al., 2021; Holmes et al., 2020; Jacobson et al., 2020; Liu et al., 2020). Accordingly, experts predicted a major mental health crisis may parallel the COVID-19 pandemic (The Lancet Public Health Editorial, 2020). Salient mental health consequences may be particularly experienced by young adults, who are in a developmental stage in which mental health symptomology becomes more prevalent (Baik et al., 2019; Kessler et al., 2005; Schulenberg et al., 2005). Young adults also show greater loneliness relative to other age groups (Luhman & Hawkley, 2016). As such, there is a need to examine changes in young adults' mental health and well-being, relative to pre-COVID-19 pandemic levels, and to longitudinally track these indices throughout the duration of the pandemic.

National estimates for the USA show that young adults have the highest prevalence of meeting diagnostic criteria for a past year mental health illness, compared to other age groups (SAMSHA, 2018). Findings from the initial acute phases of the COVID-19 pandemic (i.e., the first few months, when lockdowns were most stringent) highlight that relative to older adults, the COVID-19 pandemic had more dramatic negative effects on young adults, who experienced the greatest increase in psychological distress (McGinty et al., 2020). Loneliness among young adults also increased more than in other adult age groups during the early stages of the pandemic (Luchetti et al., 2020;

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Weissbourd et al., 2021), especially for young adults who had more social support prior to the pandemic (Lee et al., 2020). COVID-19 guidelines had, at times, discouraged in-person socializing (Einberger et al., 2021), which presented a major challenge for young adults; college students who reported less social support and connectedness with their peer groups during the early stages of the pandemic reported lower well-being and greater symptoms of depression (Graupensperger et al., 2020). Moreover, social and relational stressors, such as concerns of feeling isolated from friends and social relationships, have been a key correlate of mental health, including symptoms of depression and anxiety, overall self-perceived mental health, and satisfaction with life (Graupensperger et al., 2021, 2022; Jackson & Williams, 2021; Shanahan et al., 2020). Ultimately, it has become clear that young adults are a high-risk group for mental health and psychological distress during the COVID-19 pandemic.

To date, research on young adults' mental health and well-being during the COVID-19 pandemic has largely been cross-sectional or of limited duration. Some studies have nevertheless identified within-person changes in mental health (Hawes et al., 2021a, b) and loneliness (Lee et al., 2020), but studies have been limited to the initial acute phases of the COVID-19 pandemic and examined relatively few time points. Although these initial studies have been timely and valuable, there is a need to examine initial changes in indices of mental health and well-being alongside longitudinal data showing longer-term trends as the pandemic progressed. Young adults may be settling into the "new normal" (Corpuz, 2021), which may ease some concerns related to mental health and well-being, but alternatively, the prolonged pandemic may be associated with elevated concerns even years after the initial phases. One study of adolescents in New York state found a gradual decline in depression and anxiety symptoms from April 2020 to July 2020, providing some indication that mental health concerns may have subsided, on average, as the COVID-19 pandemic progressed (Hawes et al., 2021a, b). As this question remains untested among young adults and across a larger time span, to our knowledge, there is a critical need to examine longitudinal trends to identify whether initial spikes in mental health symptomology and loneliness have persisted across the course of the pandemic or have generally returned to pre-pandemic levels, on average. Beyond our understanding of mental health in the context of the COVID-19 pandemic, investigating these longitudinal trends can offer guidance for future research related to the pandemic as additional longitudinal data is collected and for informing clinical interventions that may be quickly adapted for future times of acute public health crises.

Current Study

The current study examined longitudinal trends in young adults' depression symptoms, anxiety symptoms, loneliness, and satisfaction with life across 18 months—from January 2020 (pre-pandemic) to August 2021. Specifically, we examined these indices of mental health and well-being in a longitudinal cohort of young adults at eight timepoints: (a) pre-pandemic in January 2020, (b) during the acute early stages of the pandemic in April/May 2020, and (c) six bi-monthly follow-ups spanning September 2020–August 2021.

The goals of this study were largely descriptive. We modeled trends in indices of mental health and well-being across time to characterize the pattern of these symptoms throughout the initial year-and-a-half of the COVID-19 pandemic. It was hypothesized that there would be an initial spike from January to April/May 2020 in mental health symptoms and loneliness, and an initial decrease in satisfaction with life, in line with a study of a younger (i.e., adolescent) sample that showed increased depression and anxiety symptoms (Hawes et al., 2021a, b). We anticipated trends would return to, or approach, pre-pandemic levels, on average as the pandemic progressed. This second hypothesis is based on theorizing that young adults may adjust to a new normal as the pandemic progressed (Corpuz, 2021), which is a trend that has been demonstrated in younger adolescent samples (e.g., Hawes et al., 2021a, b).

Method

Participants and Procedures

The current study enrolled participants from an ongoing longitudinal study broadly focused on young adult life transitions. The parent study enrolled a community sample of 778 young adults on a rolling basis between February 2015 and January 2016 to complete monthly surveys for 24 months, with additional follow-ups to continue monitoring young adult development and health behaviors up through 2 ½ years later. Inclusion criteria into the parent study included being between the ages of 18 and 23 at screening, drinking at least one alcoholic beverage in the past year, and living within 60 miles of the study office in Seattle, WA. Additional supplemental surveys were conducted in the sample in January 2020 (pre-pandemic) and late April/early May 2020 (early pandemic). Following that, bi-monthly surveys were conducted from September 2020 through August 2021, covering approximately the first year-and-a-half of the COVID-19 pandemic. All participants in

the original parent study were invited to participate in the additional supplemental and COVID-19 surveys. They were re-consented for participation in January 2020, April/May 2020, and September/October 2020 (for the 6 additional surveys).

For the current study, we used data from January 2020 through August 2021 surveys. The survey window for the January survey extended from January 6th to January 30th, and the survey window for the April/May survey was from April 21 to May 18.[1] These surveys asked participants about "*the past month*." For the bi-monthly surveys, the sample was randomized such that half of the sample began in September of 2020, and the other half began in October of 2020. Surveys were completed within the first 3 weeks of each month. Surveys asked participants to report on the previous month (e.g., June surveys asked about May); and the subsequent follow-ups refer to August 2020 through August 2021.

Regarding the sample, 594 young adults participated in the January 2020 survey (76.3% of the original cohort) and 552 participated in the April/May survey (71.0%). The bi-monthly surveys were presented as a unique opportunity for the original cohort, and even those who did not complete the previous January or April/May surveys were invited to enroll. We had 569 young adults participate in at least one survey in the bi-monthly repeated assessment portion of this study (73.1% of the original cohort). Participants completing at least one of the surveys between January 2020 and August 2021 were included in the analyses. In total, the analytic sample included 656 young adults (M_{age} = 25.6 years; SD_{age} = 1.80; 59.3% reported their sex assigned at birth as female and, pertaining to race/ethnicity, 54.7% identified as White/Caucasian non-Hispanic (NH), 18.0% identified as Asian/Asian American NH, 8.4% identified as Hispanic, and 18.9% identified as other NH. Although participants were initially recruited in Washington State, 29.8% indicated they currently reside outside of Washington State during the April/May 2020 survey. After each survey, study participants received a $20 gift card as compensation for their time, except for month 6 when they received $40. All procedures were approved by the Institutional Review Board at the authors' university.

Measures

Past month symptoms of depression were assessed using the Patient Health Questionnaire short scale (PHQ-2) at each timepoint (Kroenke et al., 2009). Items included "*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*. Items were summed, and Spearman-Brown reliability estimates ranged from α = 0.86 to α = 0.90 across all time points.

Past month symptoms of anxiety were assessed using items from the shortened Generalized Anxiety Disorder screening tool (GAD-2; Kroenke et al., 2009). Items included "*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, and Spearman-Brown reliability estimates ranged from α = 0.84 to α = 0.89 across all timepoints.

Past month loneliness was assessed using the shortened UCLA loneliness scale (Hughes et al., 2004). This scale asks participants to indicate how often they "*feel they lack companionship,*" "*feel left out,*" and "*feel isolated from others.*" Response options ranged from 1 = *Hardly ever* to 3 = *Often*, and the three items were summed to create a total loneliness score. The scale showed strong reliability at each timepoint (Cronbach's α ranged from 0.78 to 0.83).

Satisfaction with life was assessed at each timepoint with the 5-item Satisfaction with Life Scale (Diener et al., 1985). On 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 were summed to create a total score, and the scale had high reliability at each timepoint (Cronbach's α ranged from 0.91 to 0.93).

Analyses

Multilevel spline growth models were used to estimate change in each of the four outcomes from January 2020 (pre-pandemic) to August 2021. Spline growth models separate time into discrete periods and predict the observed changes in each period with simple (e.g., linear, quadratic) growth models (Grimm et al., 2017). The segments in each time period connect at knot points, or transition points, where one period ends and another begins. Spline models can be particularly useful when there are theoretical reasons to divide time into discrete periods, such as before and after the onset of a pandemic. The time metric used here was months, with the first chronological timepoint coded as 0 (January 2020; data collected between January 6, 2020 and January 30, 2020). The second survey was coded as a fixed timepoint based on the range of survey completion dates (April 21, 2020 to May 18, 2020). This timepoint was coded as 4 (months since January 2020) and is referred to throughout as April/May 2020. During the bi-monthly survey period, half the participants completed surveys each month (i.e., half began in September 2020 and the other began in October 2020), and the time metric was allowed to vary across individuals. For half of the participants, responses to the September 2020 survey were coded as 8, and each of the subsequent five timepoints

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[1] Surveys for the second wave of data (i.e., early phase of COVID-19 pandemic) are referred to throughout as "April/May 2020.".

(i.e., November 2020, January 2021, March 2021, May 2021, and July 2021) were coded as 10, 12, 14, 16, and 18 months since January 2020. For the other half, responses to the October survey were coded as 9, and the following five timepoints (December 2020, February 2021, April 2021, June 2021, and August 2021) were coded as 11, 13, 15, 17, and 19 months since January 2020.

Model fit, study design, and substantive considerations were all used in the model selection process. Following recommendations for model specification and initial model selection according to model fit in Grimm et al. (2017), we fit a series of unconditional (i.e., no covariates) no growth (i.e., intercept-only), linear growth, and non-linear growth models (quadratic and spline models) using maximum likelihood estimation for each outcome. For spline models, we fit all possible models with one or two knots by fitting models with knots placed at different timepoints. After factoring in model fit, study design, and substantive considerations, we selected spline models with knots at April/May 2020 (time = 4) and September 2020 (time = 8). Fit statistics (shown in Supplemental Table A) indicated that these two-knot spline models generally had lower deviance (− 2 log-likelihood) and AIC (Akaike information criterion) values than the no-growth, linear, quadratic, and single-knot spline models. Similarly, Supplemental Table A shows the results of likelihood ratio tests which indicated that the two-knot spline models selected fit the data significantly better than linear growth models. Therefore, the two-knot spline models used here appeared to fit the data reasonably well and fit as well or better than most other models with alternative specifications. These two-knot linear models provided a parsimonious approach to examine changes in mental health and well-being during three distinct time periods: (a) pre-pandemic (January 2020) to early pandemic (April/May 2020), (b) early pandemic to mid-pandemic (September 2020), and (c) mid-pandemic to the end of the data collection period (August 2021).[2] The final conditional models that controlled for person-level, time-invariant demographic covariates were estimated using restricted maximum likelihood estimation, included a random intercept and random slopes for each segment of the spline model, and controlled for sex, age, and race/ethnicity. All models were estimated using the *lme4* package (Bates et al., 2015) in R 4.1.2 (R Core Team, 2021).

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[2] As a sensitivity check, we re-ran all models with a single knot point at September 2020 (i.e., combining the first two spline segments) and adding a binary indicator to test for a significant deviation in April/May (e.g., an uptick). These models, shown in Supplemental Table 2, had identical model fit to the original models indicating that these models were capturing the same statistical tests but with an alternative parameterization.

Results

Preliminary Analyses

As a preliminary step, we examined correlates of participation to examine whether mental health and well-being scores in January of 2020 were associated with participants' decision to opt-in to the survey in April/May 2020 or the bi-monthly longitudinal surveys. This was done using logistic regression yielding adjusted odds ratios (AORs). There were no associations between April/May participation and pre-pandemic symptoms of depression (AOR = 1.03, $p = 0.928$), anxiety (AOR = 1.06, $p = 0.551$), or loneliness (AOR = 1.12, $p = 0.220$); however, those who reported greater satisfaction with life prior to the pandemic were slightly more likely to opt-into the April/May survey (AOR = 1.06, $p = 0.007$). Pre-pandemic scores on depression symptoms (AOR = 0.97, $p = 0.761$), anxiety symptoms (AOR = 1.00, $p = 0.963$), loneliness (AOR = 1.01, $p = 0.885$), and satisfaction with life (AOR = 1.01, $p = 0.741$) all had small and statistically nonsignificant associations with participation in the bi-monthly longitudinal surveys. Taken together, the risk of sampling bias was minimal, but it should be noted that participants reporting greater satisfaction with life at baseline were slightly more likely to participate in the April/May survey.

Depression Symptoms

The intraclass correlation coefficient (ICC) indicated 53% of the total variability in depression symptoms was due to between-person differences, while 47% was due to within-person differences. The average model-predicted number of depression symptoms in January 2020 was 1.65 (Table 1; observed and model-predicted means shown in Fig. 1). Male participants had fewer depression symptoms than female participants, on average, but there were no significant differences in depression symptoms by age or race/ethnicity. Average depression symptoms *increased* from a model-predicted mean of 1.65 in January 2020 to a model-predicted mean of 1.86 in April/May 2020 ($b = 0.05$, $p < 0.01$), did not change significantly from April/May 2020 to September 2020, and *decreased* from a model-predicted mean of 1.97 in September 2020 to 1.65 in August 2021 ($b = -0.03$, $p < 0.001$). Comparing participants' final follow-up timepoint (either July or August 2021) to participants' pre-pandemic January 2020 timepoint indicated no significant difference ($b = -0.04$, $p = 0.691$), suggesting depression symptoms had approximately returned to pre-pandemic levels, on average (Supplemental Table 3).

Anxiety Symptoms

Similar to depressive symptoms, we observed substantial within-person (relative to between-person) variance in anxiety

Table 1 Multilevel spline growth models predicting change in mental health outcomes from January 2020 to August 2021

	Depression symptoms (PHQ-2)		Anxiety symptoms (GAD-2)		Loneliness		Satisfaction with life	
Fixed effects	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Initial status (Jan. 2020)								
Intercept	1.65***	0.07	2.12***	0.07	5.29***	0.07	23.26***	0.29
Male sex	−0.35***	0.10	−0.75***	0.11	−0.30*	0.12	−0.87	0.50
Age	−0.02	0.03	−0.03	0.03	−0.03	0.04	0.08	0.14
Race/ethnicity								
Asian NH	−0.17	0.13	−0.35*	0.14	0.21	0.16	−1.62*	0.66
Other NH	−0.12	0.13	−0.06	0.14	0.13	0.16	−1.96**	0.65
Hispanic	−0.04	0.19	0.08	0.20	−0.18	0.23	−1.75	0.91
White NH (Ref.)	–	–	–		–	–	–	–
Rate of change (in months)								
Slope 1	0.05**	0.02	−0.02	0.02	0.06***	0.02	−0.13*	0.07
Slope 2	0.03	0.02	0.00	0.02	0.03	0.02	−0.33***	0.06
Slope 3	−0.03***	0.01	−0.03***	0.01	−0.02**	0.01	0.12***	0.02
Random effects	Variance	Significance based on LRT	Variance	Significance based on LRT	Variance	Significance based on LRT	Variance	Significance based on LRT
Intercept	1.82	–	2.08	–	2.23	–	40.68	–
Slope 1	0.05	***	0.05	***	–	***	0.86	***
Slope 2	0.05	***	0.05	***	0.04	***	0.44	***
Slope 3	0.01	***	0.01	***	0.01	***	0.13	***
Residual variance	0.98		1.01		1.10		11.52	
ICC	0.53		0.57		0.61		0.69	

$N_{months} = 3{,}975$–$3{,}991$; $N_{persons} = 644$. Slope 1 = January 2020 (pre-pandemic) to April/May 2020 (early pandemic); slope 2 = April/May 2020 to September 2020 (mid-pandemic); slope 3 = September 2020 to end of data collection (August 2021); for the loneliness model, there was insufficient variance to estimate a parameter for Slope 1, and this random effect was thus fixed to 0

PHQ-2 Patient Health Questionnaire, *GAD-2* Generalized Anxiety Disorder Screener, *NH* Non-Hispanic, *LRT* Likelihood ratio test, *ICC* intraclass correlation coefficient

* $p < .05$; ** $p < .01$; *** $p < .001$

symptoms (ICC = 0.57). The average model-predicted number of anxiety symptoms in January 2020 was 2.12. On average, male participants and Asian NH participants had fewer anxiety symptoms than female participants and White NH participants, respectively. There were no significant differences in anxiety symptoms by age, and the anxiety symptoms of neither Other NH nor Hispanic participants differed significantly from those of White NH participants. There were no statistically significant changes in average anxiety symptoms from January 2020 to April/May 2020 or from April/May 2020 to September 2020 (Fig. 2). The average number of anxiety symptoms decreased from a model-predicted mean of 2.05 in September 2020 to 1.71 at the end of data collection in August 2021 ($b = -0.03$, $p < 0.001$). Anxiety symptoms reported in participants' final follow-up (July or August 2021) were significantly lower than their pre-pandemic anxiety symptoms reported in January 2020, on average ($b = -0.38$, $p < 0.001$; Supplemental Table 3).

Loneliness

Relative to depressive and anxiety symptoms, a somewhat smaller, but still substantial, proportion of within-person relative to between-person variance in loneliness was observed (ICC = 0.61). The average model-predicted loneliness score was 5.29 in January 2020. Loneliness scores were lower for male participants than female participants, on average, but there were no significant differences in loneliness scores by age or race/ethnicity. Average loneliness scores increased from a model-predicted mean of 5.29 in January 2020 to 5.53 in April/May 2020 ($b = 0.06$, $p < 0.001$), did not change significantly from April/May 2020 to September 2020, and decreased from a model-predicted mean of 5.63 in September 2020 to 5.42 in August 2021 ($b = -0.02$, $p < 0.01$: Fig. 3). Loneliness at the final follow-up timepoint (July or August 2021) was not significantly different than the pre-pandemic January 2020 timepoint ($b = 0.09$, $p = 0.409$),
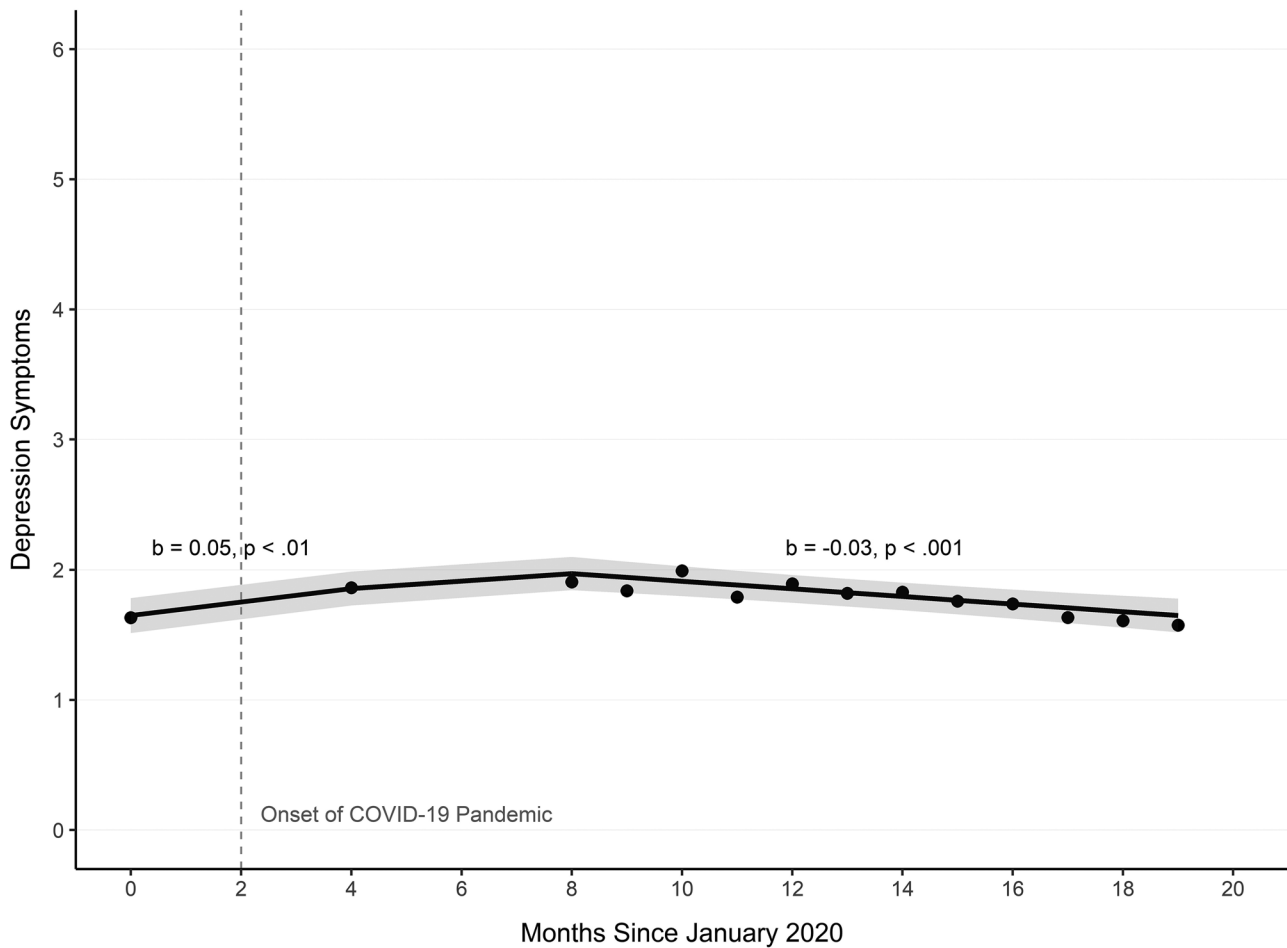
Fig. 1 Observed means for depression symptoms at each timepoint (points) and model-predicted means estimated from spline growth models (line). In the spline growth plots, confidence bands represent 95% confidence interval and significant spline slopes are indicated with the slope labels. Segments without slope labels are non-significant (i.e., $p > .05$)

suggesting loneliness had approximately returned to pre-pandemic levels, on average (Supplemental Table 3).

Satisfaction with Life

The majority of variance in satisfaction with life was due to between-person difference (ICC = 0.69). The average model-predicted satisfaction with life score was 23.26 in January 2020. Satisfaction with life scores was lower on average for Asian NH and Other NH participants relative to White NH participants but did not differ between Hispanic and White NH participants. There were no significant differences in average satisfaction with life scores by sex or age. Average satisfaction with life scores decreased from a model-predicted mean of 23.26 in January 2020 to 22.73 April/May 2020 ($b = -0.13$, $p < 0.05$) and decreased from a model-predicted mean of 22.73 in April/May 2020 to 21.42 in September 2020 ($b = -0.33$, $p < 0.001$: Fig. 4). Average satisfaction with life scores increased from a model-predicted

mean of 21.49 in September 2020 to 22.74 in August 2021 ($b = 0.12$, $p < 0.001$). By the final follow-up timepoint (July or August 2021), satisfaction with life had approximately returned to pre-pandemic levels, on average, as indicated by a non-significant difference when compared to the pre-pandemic January 2020 timepoint ($b = -0.45$, $p = 0.322$; Supplemental Table 3).

Discussion

Findings from this longitudinal study shed light on trajectories of mental health and well-being of young adults from 2 months before COVID-19 social-distancing restrictions were put in place to a year-and-a-half into the pandemic. At the beginning of the COVID-19 pandemic, there were major concerns that the quarantine and strict physical distancing policies would facilitate major spikes in mental health problems and steep declines in well-being (Holmes
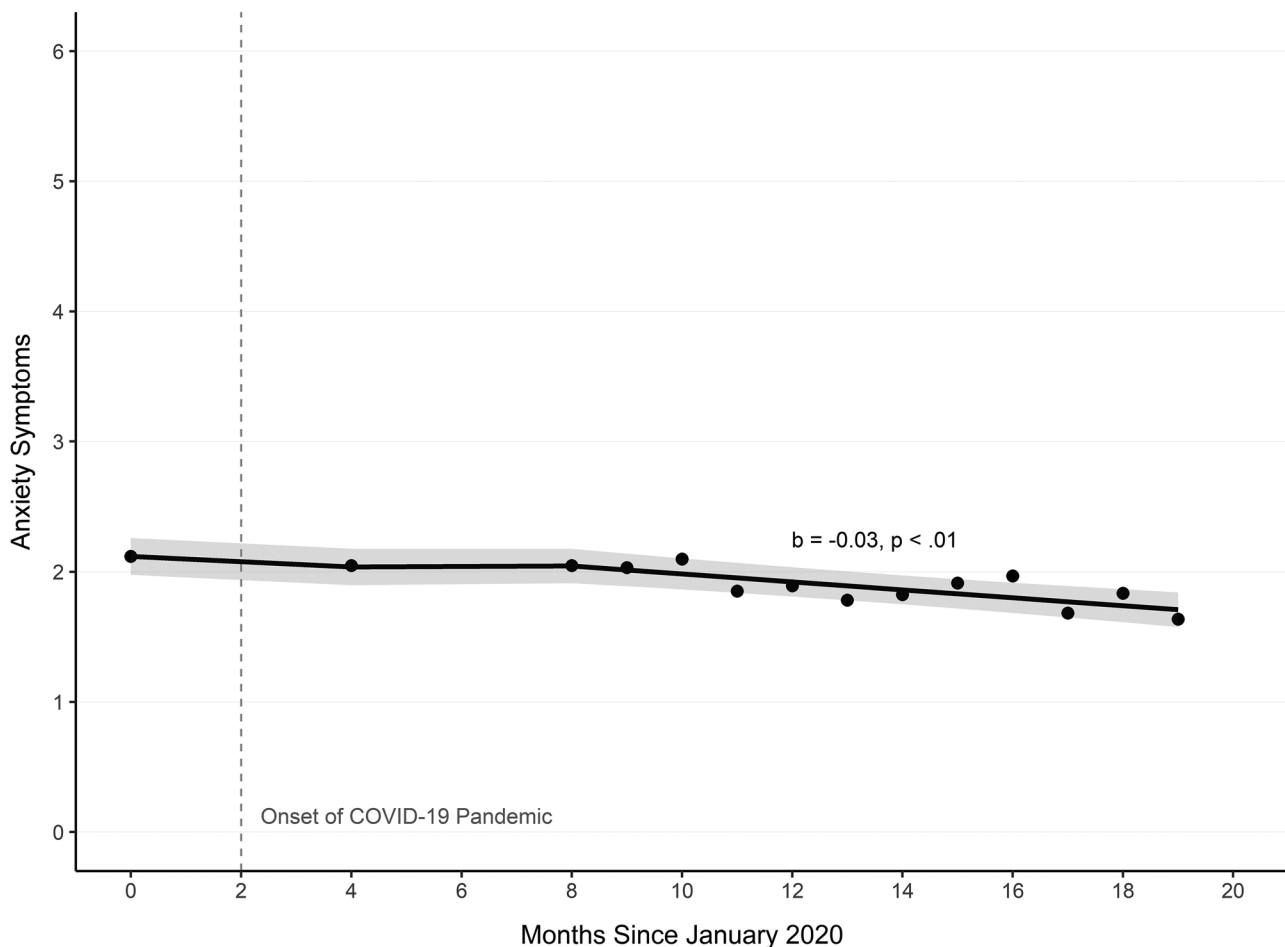
Fig. 2 Observed means for anxiety symptoms at each timepoint (points) and model-predicted means estimated from spline growth models (line). In the spline growth plots, confidence bands represent 95% confidence interval, and significant spline slopes are indicated with the slope labels. Segments without slope labels are non-significant (i.e., $p > .05$)

et al., 2020; Killgore et al., 2020; Pfefferbaum & North, 2020). Relative to participants' pre-pandemic reports in January 2020, our data show significant increases in depression symptoms and loneliness during the initial phase of the COVID-19 pandemic, but no significant changes in anxiety symptoms or satisfaction with life. These findings are particularly valuable given the repeated measures assessment enables stronger inferences of within-person change (i.e., rather than comparing separate cohorts), relative to a pre-pandemic timepoint (January 2020) that was proximal to the declaration of the pandemic in March 2020. Despite adding support to early hypotheses that a mental health crisis may follow the COVID-19 pandemic (The Lancet Public Health Editorial, 2020), the data show that, on average, increases in depression and loneliness were relatively minor and shifts in anxiety and satisfaction with life were non-significant. Ultimately, the results indicate that, despite statistically significant increases in indices of depression and loneliness in this sample, the magnitude of increased mental health

concerns in the early stages of the pandemic was small, on average. The findings that anxiety had not significantly increased, on average, adds to a mixed literature examining changes in this early-pandemic time period. In one prior study (Hawes et al., 2021a, b), researchers found an increase in both generalized and social anxiety symptoms, though notable differences include their study compared participants at age 18 to a previous time point at age 15, took place in New York state, and used a child-specific measure of anxiety symptoms. Conversely, other studies from the UK have reported no changes (Daly et al., 2021) or even decreases in anxiety symptoms when examined prospectively (Young et al., 2021).

Spline growth models also examined changes in mental health and well-being from April/May to September/October 2020, which is a period in which it became clear to many that the COVID-19 pandemic may persist longer than originally anticipated (Scudellari, 2020). The patterns indicated slight but non-significant increases in depression
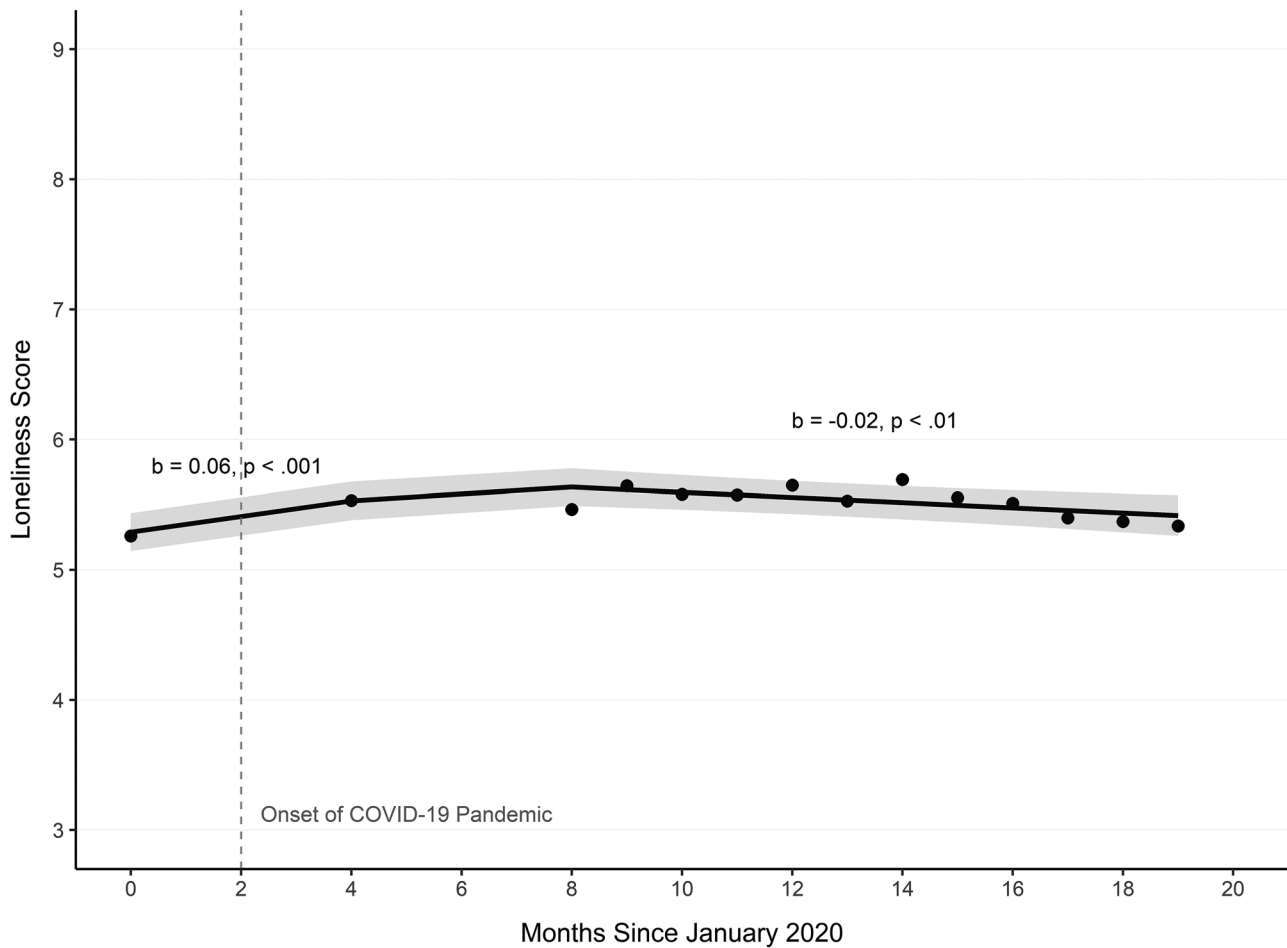
Fig. 3 Observed means for loneliness at each timepoint (points) and model-predicted means estimated from spline growth models (line). In the spline growth plots, confidence bands represent 95% confi-dence interval, and significant spline slopes are indicated with the slope labels. Segments without slope labels are non-significant (i.e., $p > .05$)

and loneliness, showing sign of plateauing after the initial significant increases from January to April/May 2020. By this point in the pandemic, many young adults may have found alternative methods of socializing (e.g., web-based) that may have prevented escalation of depression and loneli-ness, on average (Kutscher & Greene, 2020). Additionally, although most prior research in general population samples shows seasonal variation in mental health to be small or nonexistent on average (LoBello & Mehta, 2019; Lukmanji et al., 2019), it is possible that spring and summer weather in the northern hemisphere may have enabled opportuni-ties for socializing in outdoor areas. However, there was a relatively steep decline in satisfaction with life during this period from April/May to September 2020, possibly as the life disruptions and pandemic-related stressors began mount-ing (e.g., financial difficulties; Graupensperger et al., 2021). People also began experiencing a unique form of burnout that has been termed "pandemic fatigue" and entails feelings of hopelessness, alienation, and demotivation to continue

abiding by policies and rules pertaining to the pandemic (Reicher & Drury, 2021). As with the changes in mental health indices during the initial phase of the COVID-19 pan-demic, the magnitude of changes in mental health during this second segment was generally small, on average.

The final period of the spline growth model captured changes in mental health and well-being from September 2020 to August of 2021. Changes across this period showed that depression symptoms, anxiety symptoms, and loneliness all significantly *decreased*, while satisfaction with life signifi-cantly increased. Whereas depression, loneliness, and satis-faction with life all approximately returned to pre-pandemic levels (similar to January 2020), on average, anxiety symptoms decreased to levels that were even lower than pre-pandemic levels. Findings generally indicated that, on average, indices of young adults' mental health and well-being in this study have begun to return to normative pre-pandemic levels. On one hand, the COVID-19 pandemic remained a very salient threat during this period as demonstrated by a peak in daily cases in
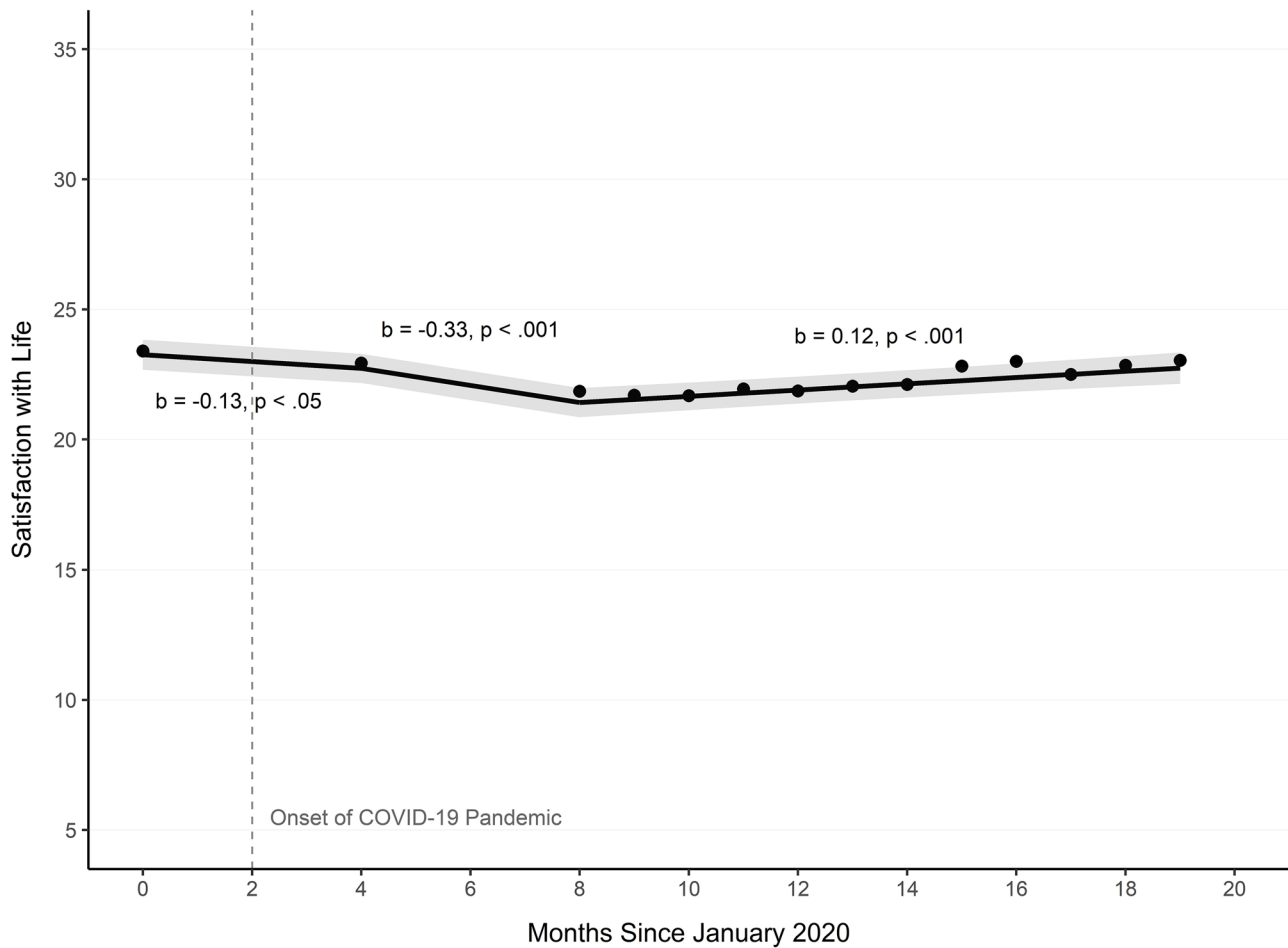
Fig. 4 Observed means for satisfaction with life at each timepoint (points) and model-predicted means estimated from spline growth models (line). In the spline growth plots, confidence bands represent the USA (i.e., approximately 250,000 per day; CDC, 2021). On the USA (i.e., approximately 250,000 per day; CDC, 2021). 95% confidence interval and significant spline slopes are indicated with the slope labels. Segments without slope labels are non-significant (i.e., $p > .05$)

the USA (i.e., approximately 250,000 per day; CDC, 2021). On the other hand, vaccination among young adults had become widely available, and mandates and restrictions had been increasingly lifted during this period, including re-opening of restaurants and other indoor venues in most states, as well as entertainment activities such as movie theaters, concerts, and sporting events (Drury et al., 2021). These data may also support the hypothesis that people will adjust to a new normal as the COVID-19 pandemic progresses (Corpuz, 2021) and, at the time of this writing, does not appear to have a concrete end in sight. In any case, the findings may be encouraging as many had anticipated concerns for young adults' mental health and well-being may remain or continue to worsen across the prolonged pandemic (The Lancet Public Health Editorial, 2020).

Taken together, study findings revealed relatively minimal shifts in young adults' mental health and wellbeing across the first 18 months of the COVID-19 pandemic, though it should be reiterated that findings show *average* changes in these indices. Importantly, there is likely much heterogeneity in the extent that young adults experienced declines in mental health, and these trend-level analyses are not intended to fully capture the range of experiences. Future research could extend these findings and examine whether there are young adults who may be more vulnerable to pandemic-related influences leading to experiencing worse mental health trajectories or who might take longer to return to baseline. For example, young adults who were in greater financial distress resulting from the pandemic or who might already be struggling with mental health issues pre-pandemic may be greater risk for higher or prolonged mental health issues. Additionally, a key contribution of future work would be to examine resilience factors that may have provide a buffer to increases in loneliness, anxiety, and depression such as social support and perceived self-efficacy (Li et al., 2021; Prince-Embury & Saklofske, 2013).

Findings from the present study hold notable applied implications for prevention and can inform future time-sensitive adaptations of existing interventions for future public health

crises (e.g., future pandemics, natural disasters) or community stressors (e.g., financial recession) and the need to be able to adapt existing evidence-based interventions. The findings from the present study suggest that many young adults may have benefited from targeted brief interventions that supported coping skills for depression and loneliness early on in the pandemic and occasionally throughout the year. Some of these messages may normalize adverse experiences during a challenging time, such as feeling increased distress or emotions, with tips and strategies for managing these emotions (e.g., Cadigan et al., n.d.). Furthermore, messages could also highlight if and when an individual may need to seek further supports from mental health professionals and provide concrete resources for tips for how to access those resources. One of the barriers for seeking mental health treatment in non-pandemic times is not knowing where or how to access mental health treatment (Cadigan et al., 2019), and these barriers may have been more salient during the pandemic when access may have been limited, highlighting the need for young adults to receive accurate and direct information for how to access help (e.g., how to select a provider, questions to ask providers, availability of providers in community). Ultimately, the knowledge gained from this study informs content and timing of future prevention efforts and highlights the need for developing pre-existing strategies prior to major adverse events.

Limitations

Several limitations warrant consideration alongside the strengths of the current study. Although this study is the first to our knowledge to track young adults' mental health and well-being at the within-person level starting with a pre-pandemic timepoint and across the first 18 months of the pandemic, there remains a need to continue examining developmental trajectories of young people across the next several years if not decades before we will understand the full impact of the COVID-19 pandemic. We also note that the pre-pandemic survey was administered in January of 2020, and that some young adults may have already been aware and possibly impacted by the rapid developments of the first confirmed US cases of COVID-19 in WA state in late January, despite the World Health Organization not declaring a pandemic until March 11, and statewide stay-at-home orders beginning March 23 in WA state. The measures used to assess depression and anxiety symptoms were shortened scales (i.e., PHQ-2, GAD-2) that, despite evidence of adequate psychometric properties among young adults (e.g., Khubchandani et al., 2016), limit the amount of detectable variability over time. Pertaining to sample limitations, the cohort of young adults we examined was demographically representative of the community they were originally recruited from (Seattle, WA), but may not generalize to all geographic regions of the USA. Although participants were assessed at numerous timepoints throughout

the study period, it is difficult to tease-apart the potential for seasonal effects from variability otherwise attributed to the COVID-19 pandemic. Furthermore, we asked participants to report on mental health symptomology from the previous month, which introduces potential for recall bias.

As it pertains to future directions building upon these descriptive findings, forthcoming studies will begin to identify between-person differences in mental health and well-being across the pandemic, and factors that explain some of the within-person variability in these indices over time. Additionally, building upon these trends in mental health over time, it would be prudent to examine comorbidities between these indices of mental health and examine whether increased symptomology in one domain prospectively relates to increased symptomology in another (e.g., increased loneliness may precede increased depression symptoms).

Conclusions

The present study examined trajectories of mental health and well-being in a community sample of young adults across the first year-and-a-half of the COVID-19 pandemic. Relative to the pre-pandemic survey in January 2020, there were significant increases in depression symptoms and loneliness in April/May 2020, but these indices began to plateau by September 2020 and then significantly decreased across the subsequent year until the end of the data collection period (July/August 2021). Satisfaction with life decreased from April/May to September 2020 before increasing across the final year of data collection to levels that were similar to pre-pandemic reports. Curiously, anxiety symptoms were unchanged from January to April/May 2020 and from April/May to September 2020, but significantly decreased across the final year of the study period to levels that were lower than at the pre-pandemic survey. Ultimately, these descriptive data provide evidence of initial concerns for young adults' mental health and well-being in the initial months of the COVID-19 pandemic and may highlight some optimism that indices of young adult well-being, on average, may be returning back to pre-pandemic levels. Although additional longitudinal monitoring remains crucial, these data provide important insights into young adults' mental health and well-being throughout the first year-and-a-half of the pandemic that may be valuable if we face similar pandemic scenarios in the future.

Declarations

Ethics Approval All aspects of the present study were approved by the Institutional Review Board at the University of Washington. No adverse events were reported. The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments.

Informed Consent All participants completed informed consent.

Conflict of Interest The authors declare no competing interests.

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