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The effects of the pandemic on mental health in persons with and without a psychiatric history

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Abstract

Background. Prospective studies are needed to assess the influence of pre-pandemic risk factors on mental health outcomes following the COVID-19 pandemic. From direct interviews prior to (*T1*), and then in the same individuals after the pandemic onset (*T2*), we assessed the influence of personal psychiatric history on changes in symptoms and wellbeing.

Methods. Two hundred and four (19–69 years/117 female) individuals from a multigenerational family study were followed clinically up to *T1*. Psychiatric symptom changes (*T1*-to-*T2*), their association with lifetime psychiatric history (no, only-past, and recent psychiatric history), and pandemic-specific worries were investigated.

Results. At *T2* relative to *T1*, participants with recent psychopathology (in the last 2 years) had significantly fewer depressive (mean, $M = 41.7$ *v.* 47.6) and traumatic symptoms ($M = 6.6$ *v.* 8.1, $p < 0.001$), while those with no and only-past psychiatric history had decreased wellbeing ($M = 22.6$ *v.* 25.0, $p < 0.01$). Three pandemic-related worry factors were identified: Illness/death, Financial, and Social isolation. Individuals with recent psychiatric history had greater Illness/death and Financial worries than the no/only-past groups, but these worries were unrelated to depression at *T2*. Among individuals with no/only-past history, Illness/death worries predicted increased *T2* depression [$B = 0.6(0.3)$, $p < 0.05$].

Conclusions. As recent psychiatric history was not associated with increased depression or anxiety during the pandemic, new groups of previously unaffected persons might contribute to the increased pandemic-related depression and anxiety rates reported. These individuals likely represent incident cases that are first detected in primary care and other non-specialty clinical settings. Such settings may be useful for monitoring future illness among newly at-risk individuals.

Introduction

Studies worldwide have reported population increases in depression and anxiety resulting from the ongoing COVID-19 pandemic (Abbott, 2021; Gloster et al., 2020; Xiong et al., 2020). Because most studies were initiated after the pandemic began, they lack prospectively collected *pre-pandemic* clinical data on individuals. This may result in inaccurate conclusions about the pandemic-associated pathology, and limit identification of newly at-risk individuals.

A literature search yielded 13 studies with contemporaneously procured pre-pandemic data, albeit with varied research questions, measures, and circumscribed populations of interest. Two studies focused on older adults (age 52+), and/or senior citizens (mean age 77 years) with disabilities (Mishra et al., 2021; Steptoe & Di Gessa, 2021), and one study focused on younger adults (mean age 24 years) and teenagers (Hawes, Szenczy, Klein, Hajcak, & Nelson, 2021; Rogers, Ha, & Ockey, 2021). Three studies investigated psychological symptoms among pregnant women or mothers (Layton, Owais, Savoy, & Van Lieshout, 2021; Racine et al., 2021; Zilver et al., 2021). One study examined pandemic effects on eating disorders, exercise addiction, and body dysmorphia among health club users (Trott, Johnstone, Pardhan, Barnett, & Smith, 2021). The remaining six studies were population-based.

Among the six population-based studies, three leveraged cohorts from the UK (Kwong et al., 2020; Niedzwiedz et al., 2021; Pierce et al., 2021), and the remaining three were based respectively in Spain (Ayuso-Mateos et al., 2021), Ireland (Hyland et al., 2021), and the Netherlands (Pan et al., 2021). Most of these studies revealed variable changes in mental

health from pre- to post-pandemic, depending on age, gender, race/ethnicity, elements of socioeconomic status (SES), and pre-existing physical and or mental health status. Moreover, significant increases in symptoms (decreased mental health) were observed among younger individuals, women, racial/ethnic minorities, and individuals from lower SES backgrounds (Ayuso-Mateos et al., 2021; Kwong et al., 2020; Niedzwiedz et al., 2021; Pierce et al., 2021). In addition, pre-existing psychiatric or psychological symptoms were associated with decreased mental health from pre- to post-pandemic (Kwong et al., 2020; Pierce et al., 2021).

These increases in symptoms found in the prospective longitudinal studies are consistent with findings from cross-sectional prevalence studies, including those from two US epidemiological studies, showing greater prevalence of anxiety and depression symptoms from pre- to post-pandemic, particularly among younger and lower SES groups (Daly, Sutin, & Robinson, 2021; Ettman et al., 2020; Wanberg, Csillag, Douglass, Zhou, & Pollard, 2020).

However, there have been some suggestions that individuals with an existing psychiatric history may be at *decreased* risk for adverse mental health during the pandemic. For example, a report of three large Dutch cohorts (Pan et al., 2021) with pre- and post-pandemic data found that individuals with past psychiatric history did not get worse, whereas the most affected were those with no history of psychiatric disorders. Other studies have reported similar resilience against suicidal behaviors following the pandemic in those with a psychiatric history (Ahmad & Anderson, 2021; Pirkis et al., 2021). To our knowledge to-date, there have been no comparable US-based studies examining within-person pandemic effects on psychiatric symptomatology according to pre-existing psychiatric health status. This gap should be addressed, given the pronounced impact of the COVID-19 pandemic on work protocols, social interactions, medical practices, and other facets of living in the USA.

Accordingly, we report on participants from a US cohort, followed for up to 38 years with direct clinical interviews on themselves and their relatives, with diagnoses across the lifetime independently confirmed by a psychiatrist or psychologist (Weissman et al., 1987, 2006). These participants had most recently been interviewed 0–2.5 years prior to the pandemic's onset in March 2020 (pre-pandemic onset, *T1*). We then reassessed participants during the pandemic between September 2020 and February 2021 (post-pandemic onset, *T2*). In addition to the personal history of psychiatric disorders, data on family history as a potential risk factor were available. We examine changes in depression, anxiety, trauma, suicidality, and wellbeing (positive affect), as well as COVID-19-related concerns, during the pandemic in individuals with and without a family or personal (recent and past) psychiatric history.

Method

The analyses are based on a longitudinal family study of three generations at high and low risk for depression (Weissman et al., 1987, 2016). Briefly, the study began in 1982 with the recruitment of two groups of first generation probands (G1). The first was recruited from outpatient clinics and included probands with moderate-to-severely impairing major depressive disorder (MDD) but no schizophrenia, antisocial personality disorder, bipolar disorder, or primary substance use disorder. The second was selected from an epidemiologic sample in the same community, and had no lifetime history of psychiatric illness, as confirmed through several interviews. Second (G2) and third (G3) generation offspring of probands with and without MDD constitute the high and low-risk groups, respectively (Weissman et al., 1987).

The families had been followed for up to 38 years, across seven waves (Weissman et al., 2006, 2016). Clinical assessments included a semi-structured clinical interview based on the adult or child version of the Schedule for Schizophrenia and Affective Disorders (Endicott & Spitzer, 1978; Kaufman et al., 1997) by a clinician with each family member, blind to family history. Each interview covered the time period from the previous interview; thus, total assessment timeframe was always lifetime until most recent interview, regardless of the number of intervening interviews. Final diagnoses were made by a M.D. or Ph.D. clinician using the best-estimate procedure (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982).

Procedures

The *T1* assessments and interviews were conducted 0–2.5 years prior to pandemic onset. Participants from *T1* were invited to complete an online survey administered through Qualtrics software, version 2020/2021 (Qualtrics, 2020). All *T2* participants provided consent, and the study was approved by the Internal Review Board (IRB) of the New York State Psychiatric Institute. *T2* data collection began in August 2020, approximately 6 months after presidential (Staff, 2021) and governor-issued executive orders for lockdowns and social distancing in Connecticut and New York (Hughes & Haynes, 2020), where most participants or their close relatives reside. *T2* data collection ended in February 2021, when restrictions were still widely in place, and vaccine rollout had not been widely established.

Analytical sample

Two-hundred forty-nine (249) individuals completed assessments and clinical interviews at *T1*. These individuals were invited via email or telephone to participate at *T2*. In total, 204 (82%) individuals participated in the study at *T2*. Non-participants had higher suicidality (IDAS score, 8.0 *v.* 7.0) and traumatic symptoms (7.8 *v.* 6.7), and lower wellbeing scores (20.1 *v.* 23.1) (all $ps < 0.05$) than participants, but the groups did not differ on other baseline and clinical characteristics, including MDD familial risk and psychiatric history (online Supplementary Table S1).

For analyses involving psychiatric history, we excluded eight people who completed their *T1* interview after 20 March 2020, and six people who missed one or more assessment time points up to *T1*, yielding an analytic sample of 190. Individuals in the analytic group completed their *T1* assessments between July 2017 and February 2020. Average time from *T1–T2* completion was a mean of 25.8 months and a median of 27 months. The 14 excluded individuals did not differ significantly from the included group on demographics (age, sex, marital status, education), risk factors (MDD status), and time of *T2* survey completion. In addition, we found no significant correlation between *T1–T2* interval length, and magnitude of change in IDAS II Depression ($r = 0.10$, $p = 0.17$), Suicidality ($r = -0.03$, $p = 0.71$), Anxiety ($r = 0.05$, $p = 0.51$), Traumatic symptoms ($r = 0.02$, $p = 0.84$), and Wellbeing ($r = -0.03$, $p = 0.64$).

Psychiatric history

Psychiatric history was primarily defined by the lifetime presence/absence of one or more 'definite' best-estimated DSM-IV/5

psychiatric disorders. Guided by distribution analysis of psychiatric history, we categorized psychiatric history in three groups: (1) 'No psychiatric history', consisting of individuals with no lifetime psychopathology ($n = 45$); (2) 'Only-past' history, comprising individuals whose most recent disorder offset occurred prior to 2 years of their *T1* interview ($n = 66$), and (3) 'Recent' history comprised individuals who met the criteria for psychiatric disorders within 2 years of their *T1* interview($n = 79$). This group could also include a subset of individuals who still met the criteria for DSM-IV disorders at the time of *T2* assessments. The past and recent groups included major mood ($n = 59$), anxiety ($n = 60$), substance use ($n = 36$), and psychotic ($n = 1$) disorders before or by *T1* [categories are not mutually exclusive; 90 (62%) had multiple disorders].

Change in symptoms from T1 to T2 was assessed using the Inventory of Depressive and Anxiety symptoms – Version II (IDAS-II) (Watson et al., 2012; Watson & O'Hara, 2017), a multidimensional measure of depression and anxiety symptoms derived through factor analysis (Nelson, O'Hara, & Watson, 2018; Stasik-O'Brien et al., 2019). The dimensions are internally consistent, with good convergent and discriminant validity, include a broad range of symptoms, and are predictive of clinical diagnoses (Watson et al., 2012). The IDAS-II has been successfully utilized in several or more longitudinal studies of depression, anxiety, or similar internalizing psychological conditions (Bartlett et al., 2019; Jin et al., 2017; Meyer, Nelson, Perlman, Klein, & Kotov, 2018), including a recent pre/post-COVID-19 study (Ayaz et al., 2020).

We selected five domains *a priori*: (i) general depression, (ii) anxiety (average of social anxiety, panic, and claustrophobia scales), (iii) traumatic symptoms (avoidance and intrusion scales), (iv) suicidality, and (v) positive affectivity (wellbeing subscale). Changes in these five domains from *T1* to *T2* (adjusting for *T1* scores) served as our primary outcome.

COVID-19 Worry Scale A 14-item worry scale was developed and implemented at *T2*, based on CDC recommendations and scientific discussions, given that there were no *a priori* data. Participants were asked questions like 'to what degree have you been worried about…e.g. family members getting COVID-19, etc.' Items were scored on a four-point Likert scale (1 – Not at all/2 – A little/3 – A moderate amount/4 – A lot).

We used exploratory factor analyses (EFA), using the Principal Axis Factoring method with Oblimin rotation (Costello & Osborne, 2005) to delineate the conceptual domains of worry associated with COVID-19, using the 14 items on the COVID worry scale. EFA (online Supplementary Table S2a) on the worry items scale yielded three domains, with factor loadings ranging from 0.62 to 0.94. One item was dropped due to poor loading on all domains and leaving 13 items. The three domains were named to be conceptually consistent with the heaviest-loading items: Worry domain 1 was named *Illness & Death* (I); domain 2, *Financial* (F); domain 3, *Social Isolation* (S).

Statistical analyses

The χ^2, independent sample *t* tests, and basic descriptive procedures were used to characterize the sample. Mean IDAS-II symptom score changes from *T1* to *T2* were evaluated using generalized linear mixed models (GLMM). We then examined these symptom changes as a function of psychiatric history (absent, past, recent). In all GLMM analyses, we specified fixed effects of time (*T1* and *T2*) and moderators, using psychiatric symptom and wellbeing measures (*T1–T2*) as dependent variables. We included a random-effects intercept with variance components for individuals. We specified robust covariance estimates to address any heteroscedasticity and other violations of model assumptions, and diagonal covariance structure for repeated measures. GLMM is uniquely suited to handle correlated measurements within the same individual, within clusters (family), and random individual fluctuations. In addition, the analysis of covariance reduces the likelihood of regression to the mean being solely responsible for symptoms change from *T1* to *T2* (Barnett, van der Pols, & Dobson, 2005). We controlled for family membership, and one more of the following based on their relationship to psychiatric history and/or dependent variable of interest: MDD risk status, generation, age, sex, marital status, education, and time of survey response, which we dichotomized into 0 = before November 2020, and 1 = after November 2020. Bonferroni adjustments were used for multiple comparisons.

Using independent samples *t* tests and χ^2 analyses, we investigated the demographic and clinical characteristics associated with the three worry domains identified by the EFA. Second, we used univariate linear regression to assess the impact of COVID worries on symptom levels at *T2*, controlling for demographics, family risk, and symptom levels at *T1*. Third, and using multinomial logistic regression, we evaluated the association between COVID worries and *T1–T2* symptom increases in depression, suicidality, anxiety, traumatic responses, and decreases in wellbeing (controlling for demographics, MDD risk, and time of survey completion). These analyses were stratified according to psychiatric history (no/past *v.* recent). In the logistic regression models, the reference categories for depression, anxiety, suicidality, and traumatic symptoms were 'stayed the same/decreased'. For wellbeing, the reference category was 'stayed the same/increase'.

Results

Baseline characteristics

Individuals with a 'Only-past' psychiatric history were older and more likely to be married compared to the 'no' and 'recent' history groups ($ps < 0.05$). Psychiatric history was not significantly associated with sex, education, or month of survey completion. MDD risk was marginally associated with psychiatric history (no/past/recent history: 48.9%/62.1%/69.6%, $p < 0.10$). MDD risk was not associated with any demographic characteristics (Table 1).

Change in symptoms

There were significant differences between those with and without a psychiatric history. Specifically, there were no *T1–T2* mean score changes in depression, suicidality anxiety, or traumatic symptoms among individuals with no history or only-past history, but there was a trend of lower wellbeing at *T2*, relative to *T1* (Table 2). Conversely, those with recent psychiatric history had significant decreases in general depression (47.6–41.7, $p < 0.001$) and traumatic symptoms (8.1–6.7, $p < 0.01$). MDD risk was not associated with change from *T1* to *T2* (not shown).

The analyses in Table 2 showed that the 'only-past history' and 'no history' groups were like each other but different from the 'recent history' on symptom changes from *T1* to *T2*. Therefore, we combined the only-past and no history groups in subsequent analyses, and as shown in Table 3 (and online Supplementary

Table 1. Sample ($n = 204$) characteristics by familial MDD risk status and psychiatric history

	Low risk ($n = 79$)	High risk ($n = 125$)	*No* psychiatric history ($n = 45$)	*Only-past* psychiatric history ($n = 66$)	*Recent* psychiatric history ($n = 79$)
T2 Age, mean (s.d.)	41.4 (14.3)	44.3 (15.3)	39.3 (15.7)[a]**	49 (13.6)[a,b]	39.8 (14.6)[b]**
<40 years, *N* (%)	43 (54.4)	54 (43.2)	27 (60.0)[a]**	20 (30.3)[a,b]	45 (57.0)[b]**
⩾40 years, *N* (%)	36 (45.6)	71 (56.8)	18 (40.0)[a]**	46 (69.7)[a,b]	34 (43.0)[b]**
Sex: *N* (%) female	43 (54.4)	74 (59.2)	25 (55.6)	34 (51.5)	49 (62.0)
Education: *N* (%) college degree or higher	40 (50.3)	69 (55.2)	27 (60.0)	38 (57.6)	37 (46.8)
Marital status: *N* (%)					
Single/never married	32 (40.5)	41 (32.8)	19 (42.2)[a]**	11 (16.7)[a,b]	41 (51.9)[b]**
Married/remarried	41 (51.9)	62 (49.6)	20 (44.4)[a]**	46 (69.7)[a,b]	27 (34.2)[b]**
Separated/divorced/widowed	6 (7.6)	22 (17.6)	6 (13.3)	9 (13.6)	11 (13.9)
Familial MDD risk: *N* (%) high risk			22 (48.9)†	41 (62.1)	55 (69.6)
Time of completion: *N* (%) completed by midpoint (before November 2020)	52 (65.8)	76 (60.8)	23 (51.1)	44 (66.7)	52 (65.8)

For continuous variables, independent samples *t* test two-tailed test of significance used. Categorical/dichotomous variables, Pearson χ^2 two-tailed test of significance used: †$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$. Bonferroni corrections were used for multiple comparisons.
[a]Significant difference between no and only-past psychopathology.
[b]Significant difference between only-past and recent psychiatric history.

Table 2. Mean score changes from *T1* to *T2* according to lifetime psychiatric history (3-category)

	Time assessed		
IDAS II symptom measures	*T1*	*T2*	Overall model *F* (df)
General depression			
No psych history	31.9 (28.4–35.4)	32.8 (29.3–36.3)	$\boldsymbol{F_{(2,\ 372)} = 8.0}$***
Only-past psych history	36.7 (33.7–39.6)	36.4 (33.5–39.4)	
Recent psych history	47.6 (44.9–50.4)	41.7 (39.0–44.5)[a]*	
Suicidality			
No psych history	6.5 (5.8–7.2)	6.5 (5.9–7.1)	$\boldsymbol{F_{(2,\ 370)} = 2.4}$†
Only-past psych history	6.9 (6.3–7.5)	6.8 (6.3–7.4)	
Recent psych history	7.9 (7.3–8.5)	7.2 (6.7–7.7)	
Anxiety			
No psych history	7.4 (6.5–8.3)	7.2 (6.3–8.1)	$\boldsymbol{F_{(2,\ 371)} = 2.9}$†
Only-past psych history	8.4 (7.6–9.2)	8.0 (7.2–8.7)	
Recent psych history	10.8 (10.1–11.5)	9.4 (8.8–10.1)	
Traumatic avoidance and intrusion			
No psych history	5.2 (4.3–6.0)	5.3 (4.5–6.2)	$\boldsymbol{F_{(2,\ 371)} = 7.7}$**
Only-past psych history	5.7 (5.0–6.5)	5.7 (4.9–6.4)	
Recent psych history	8.1 (7.5–8.8)	6.7 (5.9–7.3)[a]*	
Wellbeing			
No psych history	25.8 (23.4–28.2)	22.2 (20.0–25.0)	$\boldsymbol{F_{(2,\ 371)} = 4.2}$*
Past psych history	24.5 (22.5–26.6)	22.6 (20.4–24.7)	
Recent psych history	20.7 (18.6–22.8)	20.8 (18.7–22.8)	

Estimates (mean scores with 95% confidence intervals) obtained using general linear mixed models (GLMM) analysis, with *mean IDAS II scores* as a dependent variable. Higher mean scores indicate greater psychiatric symptoms or greater wellbeing. Bonferroni corrections were used for multiple comparisons. All models shown are controlling for family relatedness, and one or more of age, marital status, and MDD risk (variables found to be marginally or significantly associated with psychiatric history and significantly associated with *T1–T2*) symptom change. Bold results on the rightmost column indicate the significance of overall time × psychiatric history model. †$p < 0.10$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Significant decrease in symptoms from *T1* to *T2* among individuals with recent psychiatric history.

Table 3. Mean score changes from *T1* to *T2* according to lifetime psychiatric history (2-category)

	Time assessed		
IDAS II symptom measures	*T1*	*T2*	Overall model *F* (df)
General depression			
No/only-past psych history	34.7 (32.4–36.9)	34.9 (32.6–37.1)	**$F_{(1374)} = 15.8^{***}$**
Recent psych history	**47.6 (44.9–50.4)**	**41.7 (39.0–44.5)**[a]	
Suicidality			
No/only-past psych history	6.7 (6.2–7.3)	6.7 (6.7–7.2)	**$F_{(1,\ 372)} = 4.8^{*}$**
Recent psych history	7.9 (7.3–8.4)	7.2 (6.7–7.7)	
Anxiety			
No/only-past psych history	8.0 (7.4–8.6)	7.7 (7.1–8.2)	**$F_{(1,\ 373)} = 5.6^{*}$**
Recent psych history	10.8 (10.1–11.5)	9.4 (8.7–10.1)	
Traumatic avoidance and intrusion			
No/only-past psych history	5.5 (4.5–6.0)	5.5 (4.9–6.1)	**$F_{(1,\ 373)} = 15.2^{***}$**
Recent psych history	**8.1 (7.5–8.8)**	**6.6 (5.9–7.3)**[a]	
Wellbeing			
No/only-past psych history	25.0 (23.2–26.9)	22.6 (20.8–24.4)	**$F_{(1,\ 373)} = 7.3^{**}$**
Recent psych history	20.7 (18.6–22.8)	20.8 (18.7–22.8)	

Estimates (mean scores with 95% confidence intervals) obtained using general linear mixed models (GLMM) analysis, with *mean IDAS II scores* as a dependent variable. Higher mean scores indicate greater psychiatric symptoms or greater wellbeing. All models shown are controlling for family, and one or more of age, marital status, MDD risk, and generation. Bold results on the rightmost column indicate the significance of overall time × psychiatric history model. $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.
[a]Significant decrease in symptoms from *T1* to *T2* among individuals with recent psychiatric history.

Fig. S1), the results were similar when the two groups were combined into a 'no/only-past' psychiatric history group. A formal group-by-time interaction (right-most column) indicated that *T1*-to-*T2* course differed significantly between the recent and no/only-past psychiatric history groups on depression, suicidal behavior anxiety, traumatic symptoms, and wellbeing.

Further analyses showed that the pattern of decreases in symptoms among those with recent psychiatric history was evident across those with depressive, anxiety, and/or substance use disorders (online Supplementary Table S3).

T1–T2 *symptom changes associated with COVID worries*

The EFA identified three factors from the COVID worry scales, which we named Illness/death, Financial, and Social Isolation. Scores on all three worry domains were significantly higher among those under age 40 years, and single/never married; and the Illness/death and Social Isolation domains were higher among females (online Supplementary Table S2b).

Individuals with recent psychiatric history had significantly higher mean scores than those with no/past psychiatric history on illness/death (2.7 *v.* 2.4, $p < 0.05$) and financial (1.9 *v.* 1.5, $p < 0.001$), and a trend of higher mean scores on the social isolation worries (2.4 *v.* 2.2) worries (online Supplementary Table S2b). MDD risk was associated with social isolation worries (2.4 *v.* 2.1, $p < 0.05$).

We next tested whether the COVID-related worries were associated with change in symptoms from *T1* to *T2* in each group. In individuals with no or only-past history, worries about illness and death were associated with *T2* increases in depression ($B = 3.0$, S.E. = 0.9), anxiety ($B = 0.5$, S.E. = 0.2), suicidal symptoms ($B = 0.4$, S.E. = 0.1), ($ps < 0.01$), and decrease in wellbeing ($B = -1.3$, S.E. = 0.6, $p < 0.05$). Among individuals with recent psychiatric history, financial worries were associated with *T2* increases in depression ($B = 4.2$, S.E. = 1.8), anxiety ($B = 1.4$, S.E. = 0.5), and traumatic symptoms ($B = 1.1$, S.E. = 0.4) ($ps < 0.05$). For both groups, COVID-related worries about social isolation were associated with *T2* increases in depression and traumatic symptoms ($ps < 0.05$) (Table 4).

We also tested whether COVID-worry domains would predict whether a person would do better *v.* worse [defined as a dichotomously coded variable denoting decrease *v.* increase/no change in symptoms from *T1* to *T2* (and the reverse for wellbeing)]. Among individuals with recent psychiatric history, COVID worries about illness and death had greater odds of increased suicidality ($p < 0.05$) from *T1* to *T2*; those with COVID worries on financial matters and social isolation had greater odds of increased anxiety from *T1* to *T2* ($ps < 0.05$). Among individuals *without* psychiatric history, those with illness/death worries had greater odds of increased depression ($p < 0.05$) from *T1* to *T2* (Table 5).

Exploratory analysis of age-related effects on T1–T2 *symptom changes*

Given suggestions of increased pandemic-related vulnerability for younger adults (Daly et al., 2021; Varma, Junge, Meaklim, & Jackson, 2021), we investigated age-associated *T1–T2* symptom changes. We divided our sample into two age groups, guided first by our distribution analysis, which yielded a median age of 41.6 years (mean age = 42.8 years), and second, by a systematic review of COVID-related mental health across eight different countries, which noted symptom pattern differences surrounding the 40-year mark (Xiong et al., 2020). We used an overall cutoff of <40 *v.* 40 years and older. In the no/past psychiatric history group, wellbeing decreased from *T1* to *T2* in both age groups (<40 and

Table 4. *T2* Psychiatric and wellbeing symptom changes associated with COVID worry scores according to psychiatric history

	No/only-past psychiatric history ($n = 111$)			Recent psychiatric history ($n = 79$)		
	Worry domains			Worry domains		
T2 Symptom scores	Illness and death	Financial and material	Social isolation and deprivation	Illness and death	Financial	Social isolation and deprivation
General depression						
B (s.e.)	3.0 (0.9)**	1.9 (1.1)†	2.2 (0.9)*	1.3 (1.9)	4.2 (1.8)*	4.7 (1.6)**
Suicidality						
B (s.e.)	0.4 (0.1)**	0.2(0.2)	0.3 (0.1)*	0.3 (0.2)	0.2 (0.3)	0.3 (0.2)
Anxiety						
B (s.e.)	0.5 (0.2)**	0.3 (0.2)	0.3 (0.2)†	0.7 (0.6)	1.4 (0.5)*	0.3 (0.5)
Traumatic symptoms						
B (s.e.)	0.3 (0.4)	−0.1 (0.3)	0.6 (0.3)*	0.8 (0.5)†	1.1 (0.4)*	1.1 (0.4)
Wellbeing						
B (s.e.)	−1.3 (0.6)*	−0.4 (0.8)	−1.1 (0.6)†	−0.03 (1.0)	−0.5 (0.9)	−1.6 (0.8)*

Regression estimates (*B*) and standard errors obtained from univariate general linear model (GLM), two-tailed tests. For general depression, suicidality, anxiety, and traumatic symptoms figures represent unit increase in symptoms at *T2* associated with each unit increase in mean COVID score. For wellbeing, figures represent unit decrease in mean scores for each unit increase in mean COVID score. All models control for IDAS II symptoms at *T1*, sex, age, education, generation, MDD risk, marital status, and time of survey completion.
†$p < 0.10$; *$p < 0.05$; †$p < 0.10$; **$p < 0.01$.

Table 5. Impact of COVID worries on symptom changes from *T1* to *T2* according to psychiatric history

	No/only-past psychiatric history ($n = 111$)			Recent psychiatric history ($n = 79$)		
	Worry domains			Worry domains		
T1–T2 Symptom increase/decrease[a]	Illness and death	Financial	Social isolation	Illness and death	Financial	Social isolation
General depression						
Odds ratio (95% CI)	**1.7 (1.0–2.9)**	1.1 (0.6–2.1)	1.2 (0.7–1.9)	0.7 (0.4–1.4)	1.2 (0.2–2.3)	1.3 (0.7–2.2)
Suicidality						
Odds ratio (95% CI)	1.9 (0.9–4.0)	1.7 (0.8–3.7)	1.2 (0.6–2.4)	**2.5 (1.0–6.6)**	1.7 (0.8–3.4)	1.6 (0.8–3.5)
Anxiety						
Odds ratio (95% CI)	1.7 (0.9–3.0)	1.4 (0.7–2.8)	1.2 (0.7–2.0)	1.5 (0.7–3.2)	**2.4 (1.2–5.0)**	**2.4 (1.2–4.8)**
Traumatic symptoms						
Odds ratio (95% CI)	1.1 (0.6–1.8)	1.0 (0.4–2.4)	1.3 (0.8–2.2)	1.3 (0.7–2.8)	1.3 (0.7–2.7)	1.8 (0.9–3.5)
Wellbeing						
Odds ratio (95% CI)	0.8 (0.5–1.4)	1.2 (0.6–2.3)	0.8 (0.5–1.4)	1.1 (0.6–2.1)	1.3 (0.7–2.5)	0.8 (0.5–1.4)

Odds ratios (and 95% confidence intervals) obtained via multinomial logistic regression, two-tailed tests.
[a]For general depression, suicidality, anxiety, and traumatic symptoms, estimates represent the odds that an individual's depression, suicidality, anxiety, or traumatic symptoms would be higher [*v.* staying the same or becoming lower at *T2*, relative to *T1* (for wellbeing, direction is reversed)]. All models control for sex, age, education, MDD risk, marital status, and time of survey completion. Bold results denote statistical significance at $p < 0.05$.

40+), but the 40+ group had significant decreases in anxiety from *T1* to *T2* that were not observed in the younger group. Moreover, the younger group showed increasing trends in depression and traumatic symptoms, compared to the older group which showed decreasing trends in these symptoms (online Supplementary Table S4a). These age-associated divergent patterns were not observed among those with recent psychiatric history, where both age groups showed decreases in psychiatric symptoms from *T1* to *T2* (online Supplementary Table S4b).

Discussion

In the context of research on the COVID-19 pandemic mental health effects, our study contrasts the findings of many studies showing overall population increases in depression, anxiety, and other psychiatric symptoms (Abbott, 2021; Daly et al., 2021; Ettman et al., 2020; Gloster et al., 2020; Wanberg et al., 2020). We found no summary increase in mean symptom scores from *T1* to *T2*. We found that individuals with a recent psychiatric

history had reduced depressive symptoms following emergence of the pandemic. The effect was not disorder-specific: individuals with a recent history of depressive, anxiety, or substance use disorders each showed reduced symptoms. Those with either no lifetime psychiatric history or a history that was more than 2 years old but not recent, had no overall changes in symptoms, but lower wellbeing. In these groups, COVID worries were associated with greater depression and anxiety during the pandemic. Since individuals with current or recent psychopathology do not appear to be developing more symptoms, these findings suggest that a new population of persons (e.g. younger, recently non-ill) may contribute to the increased rates of depression and anxiety being reported across the world during the pandemic.

The differences between our study and some other studies may be explained in part by differences in study design (e.g. cross-sectional, or retrospective longitudinal *v.* prospective longitudinal). With respect to other prospective longitudinal studies, the divergent findings may stem from variations in geographical regions, or subtle differences in sample, symptom measures or analytic approaches. Our findings differed in part from those of Kwong et al. (2020), which found that pre-existing anxiety was associated with significantly increased anxiety during the pandemic, but in agreement with our study, pre-existing depression was not associated with increased depression during the pandemic. Our findings also differed from that of Pierce et al. (2021), which showed an increase in pandemic-associated symptoms among persons with pre-existing psychiatric illnesses. In contrast, some of our results are consistent with the aforementioned Dutch study (Pan et al., 2021) showing reduced depression and with recent studies showing decreased suicide during COVID-19 among individuals with psychiatric history (Ahmad & Anderson, 2021; Pirkis et al., 2021). A recent study showing decreased depression and anxiety and increase in quality of life in those with multiple sclerosis suggests that these patterns may extend beyond psychiatric history (Capuano et al., 2021). While we cannot formally test mechanisms, external stressors may distract from personal worries and reduce rumination in the psychiatric ill. Personal suffering may also seem more endurable with a perception of shared suffering as well as increased social/family support, phenomena reported after other major-scale events (e.g. 9–11) (Bonanno, Galea, Bucciarelli, & Vlahov, 2006; Suedfeld, 1997).

The group with no/only-past psychiatric history had no overall increases in symptoms, but a reduced sense of wellbeing during the pandemic, a pattern also reported elsewhere (Gloster et al., 2020; Ruiz et al., 2021). This was particularly true among those under 40 years, consistent with studies showing age-related vulnerabilities during the pandemic (Varma et al., 2021). Wellbeing, as assessed by the IDAS-II scale, is not simply the absence of depression; rather it encompasses a sense of positive affect, including positive accomplishment, self-pride, optimism, and energy. Lower wellbeing has been shown to predict future psychiatric illness and lower life expectancy (Keyes, Dhingra, & Simoes, 2010; Shankman, Nelson, Harrow, & Faull, 2010; Wood & Joseph, 2010) and should not be overlooked, even in the absence of formal symptoms.

COVID-19-related worries were significantly higher in younger individuals and in women. Both groups have been shown in other studies to be more severely impacted by this pandemic relative to their older and male counterparts, respectively (Daly et al., 2021; Varma et al., 2021; Wenham et al., 2020; Xiong et al., 2020). Our exploratory analyses among those without psychiatric history showed decreased wellbeing from *T1* to *T2* that was accompanied by slight increases in depression and anxiety among those under age 40, relative to their older counterparts. This younger age could partly explain our *T1–T2* decrease in wellbeing among those with no psychiatric history.

We note several study limitations which should be considered in interpreting our findings. We found that individuals who did not participate at *T2* had more traumatic and suicidal symptoms pre-COVID-19. The differences were small, and non-participation rates were low (18%), so these should not impact our findings. However, other studies have also reported greater burden of mental disorders in non-responders (Pan et al., 2021); thus COVID-19 studies – particularly those with lower retention rates – should be cognizant that participation in surveys may underrepresent more severe psychopathology. Second, among individuals with recent psychiatric history, their decrease, or no change in symptoms at *T2* relative to those without psychiatric history may be attributed to treatment interventions that they were receiving prior to and during the pandemic. However, we did not have specific treatment data in this study. The impact of treatment among individuals with pre-existing mental illness on pandemic-related stressors is worthy of additional empirical investigation. Third, the sample was not population-based, but of European ancestry, as restriction to one ancestral group was the norm for family studies when the project was initiated (1982). Thus, findings may not generalize to all racial/ethnic or other groups of interest. Fourth, although we found no significant correlation between time of *T2* assessment and outcomes on IDAS symptom measures at *T1* or *T2*, the manuscript was developed amid rapidly evolving situations surrounding the pandemic, which included fluctuating infection and mortality rates, and closing/reopening of schools, businesses, and social arenas (although our survey was completed prior to broad implementation of vaccines). Therefore, we acknowledge the limitation of our and other similar studies to accurately capture the temporal effects beyond a general month-to-month time variable of assessment. Despite these limitations, we may have detected a new vulnerable group of individuals experiencing decreased wellbeing due to irreversible loss and damage from this pandemic.

Conclusion

Our data suggest that persons with recent psychiatric history did not experience overall increased depression during the pandemic, which may be in part due to unmeasured treatment effects between *T1* and *T2*, as well as regression to the mean statistical effects. In contrast, there was an increase in psychiatric symptomatology or a decrease in wellbeing among persons who had no or past only history of psychiatric disorders. Given the absence of a recent psychiatric history, these individuals without psychiatric history may be new/incident cases of anxiety and depression who are more likely to seek medical attention in primary or non-specialty care settings. Attention to screening should be paid to these individuals, who may newly or in isolation experience symptoms related to the COVID-19 pandemic, and who may be at possible risk for future mental illness. Additional consideration should also be given to the development of assessment and treatment protocols targeted toward younger adults (under age 40) in clinical and public health settings. Integration of mental health screening and application of treatment templates within primary care systems are goals that can be beneficial in international health settings.

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