Longitudinal assessment of COVID-19 fear and psychological wellbeing in the United Kingdom

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Abstract

The COVID-19 pandemic continues to impact global psychological wellbeing. To investigate the sustained impact of COVID-19 on wellbeing, the current study longitudinally assessed fear of COVID-19, anxiety, depression, intolerance of uncertainty, worry, sleep quality, loneliness and alcohol use during the pandemic in the United Kingdom. Timepoint 1 (T1; $N = 445$) took place in February 2021 following the highest number of pandemic-related deaths in the UK. Timepoint 2 (T2, $N = 198$) took place in June 2021 when pandemic-related deaths had declined considerably, and many had been vaccinated. At T1, COVID-19 fear predicted elevated levels of anxiety, depression, intolerance of uncertainty, worry, sleep quality and loneliness. At T2, we observed that levels of COVID-19 fear, depression, loneliness and sleep quality decreased. However, COVID-19 fear continued to predict elevated intolerance of uncertainty, worry and impaired sleep quality. These findings demonstrate the longitudinal impact of COVID-19 fear on psychological wellbeing.

Introduction

The COVID-19 pandemic has resulted in the loss of millions of lives worldwide and impacted many more (Dong et al., 2020; Taylor, 2022). To combat the disease and prevent its transmission, many countries, such as the United Kingdom (UK), introduced national lockdown periods where the population were mandated to avoid contact with those outside of their household and to only make essential trips (e.g. for food/medical supplies; UK Government. Public Health England, 2020). These changes, coupled with the threat of the disease, had an immediate impact on the mental health of the population

following the first national lockdown. For example, a survey ($N = 1581$) conducted by the Office for National Statistics (2020) during the 27th of March–6th April 2020, revealed that 84.2% of the sample were 'worried' about the impact COVID-19 was having on their lives. Over half

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of the sample (53.1%) noted that it was impacting upon their wellbeing, and just under half of the sample (46.9%) noted high levels of anxiety.

The UK population reported particularly high levels of fear and anxiety about COVID-19 during its first national lockdown (commencing March 23rd, 2020), possibly due to being one of the hardest hit countries (Dryhurst et al., 2020; Lin, 2020). Fear is common in response to viral pandemics (Ahorsu et al., 2022) and serves an important function as it ensures people can detect and respond to danger appropriately. Studies have consistently demonstrated that fear of the virus predicts compliance with Government restrictions and preventative measures such as hand washing and mask wearing (Harper et al., 2021). However, prolonged, and sustained fear can produce clinical levels of psychological distress (American Psychiatric Association, 2013) and result in irritational and problematic behaviour such as panic buying (Islam et al., 2021) and extreme levels of avoidance (e.g. going without food; Davies, 2020).

Demographic predictors of COVID-19 fear

Several key sociodemographic factors have been identified as predictors of elevated COVID-19 fear, including ethnicity, age and gender. Niño et al. (2021) found that ethnic minority groups are more likely to report elevated COVID-19 fear and to perceive the virus as a major threat to individual health. These results are understandable given that Black, Asian and Minority Ethnic (BAME)[1] groups have been identified as being at greater risk of infection and death (Aldridge et al., 2020). However, contradictory results have been reported (Breakwell et al., 2022). Similarly, heterogenous results have been reported in relation to age and gender. Niño et al. (2021) found that age was positively associated with COVID-19 fear. Yet, Cerda and García (2022) found that age was inversely associated with COVID-19 fear, even though older populations

are at increased risk of death (Yanez et al., 2020). Females have also been found to report higher COVID-19 fear than males (Reznik et al., 2021). However, Erbiçer et al. (2021) found that gender did not predict COVID-19 fear.

COVID-19 fear and psychological wellbeing

The impact of COVID-19 fear on psychological wellbeing is clear, however, and is demonstrated by a range of studies since the onset of pandemic. A meta-analysis by Erbiçer et al. (2021) of 88 studies conducted between March 2020 and June 2021 found a strong positive relationship between COVID-19 fear and anxiety ($r = 0.55$, $p < 0.001$), COVID-19 fear and depression ($r = 0.34$, $p < 0.001$) and COVID-19 fear and stress ($r = 0.44$, $p < 0.001$). Thus, demonstrating the immediate psychological toll on wellbeing produced by the pandemic. COVID-19 fear has also been found to share a positive relationship with Intolerance of Uncertainty (IU; Bakioğlu et al., 2021), which refers to people's propensity to negatively react when faced with uncertain situations (Birrell et al., 2011). IU is central in the presentation and maintenance of Generalised Anxiety Disorders and may serve as a transdiagnostic feature of many psychological disorders (Mahoney and McEvoy, 2012).

The COVID-19 pandemic has also impacted on worry, sleep quality, loneliness and alcohol consumption. Hidaka et al. (2021) found elevated levels of worry because of the COVID-19 pandemic. Whilst a meta-analysis by Jahrami et al. (2021) on the prevalence of sleep problems across 13 countries found that approximately 32% of the general population experienced sleep problems during the pandemic. Given government advice to avoid contact with others to reduce the spread of the virus, it is unsurprising that COVID-19 fear has also been shown to be associated with increased loneliness, particularly under 'stay at home' orders (Lo Coco et al., 2021). The mandate to 'stay at home' has also been linked to an

increase in alcohol consumption (Lee et al., 2020) with reports showing that alcohol sales increased by over 50% in some countries (Pollard et al., 2020). In some instances, however, reported alcohol consumption has decreased in younger populations possibly due to a lack of social events and a reduction in disposable income (Steffen et al., 2021).

Longitudinal impact of the pandemic on psychological wellbeing

Longitudinal studies have also shown that the impact on wellbeing has largely persisted across the course of the pandemic and in some cases personal wellbeing has deteriorated further. Using the UK's Household Longitudinal dataset, Daly et al. (2020) found that the prevalence of mental health problems increased by 13.5% in April 2020 from pre-pandemic levels and remained elevated during May (10.4%) and June (7.6%) 2020, although with some reductions. Hidaka et al. (2021) also demonstrated that 'global' fear (i.e. anxiety related to COVID-19) increased over the course of three timepoints during the pandemic (March, May and August in 2020) with participants from the Employee Cohort Study in Japan. In the UK, Knowles et al. (2022) reported that wellbeing decreased between the first and second lockdowns. However, these studies were conducted at similar timepoints during the pandemic (e.g. when lockdowns or similar restrictions have been in place) and there have been some improvements reported in psychological wellbeing during the pandemic (O'Connor et al., 2021; Wang et al., 2020). Clearly, the timepoint at which measures are taken and the aspect of psychological wellbeing that is measured determines the nature of the change across timepoints.

Aims of the current study

The aim of the current study was to therefore undertake a longitudinal assessment of COVID-19 fear on psychological wellbeing at two distinct timepoints during the pandemic in the UK.

The aspects of psychological wellbeing which were measured at each timepoint included depression, anxiety, worry, intolerance of uncertainty, loneliness, sleep quality and alcohol consumption. Timepoint 1 (T1) was administered during the second UK nationwide lockdown (February 2021), nearly 2 weeks after the daily death count was at its highest (approx. 1300) in the UK throughout the pandemic (to date). Vaccinations rates were also very low (approx. 500,000 of the population received two doses). Timepoint 2 (June 2021) was administered when restrictions had eased considerably, deaths had decreased considerably (daily death count ranged from 5 to 11), and the vaccination rate had increased substantially (approx. 27–31 million had received two doses). Given the distinct difference in circumstances between the two timeframes (i.e. reduction in deaths and increased vaccination rate), we expected a reduction in the impact of COVID-19 fear on our psychological wellbeing measures across the two timepoints. Additionally, we also sought to examine the impact of socio-demographic characteristics such as age and ethnicity on COVID-19 fear. Specifically, we predicted that age would be positively associated with COVID-19 fear, and that there would be elevated levels of COVID-19 fear amongst BAME participants.

Methods

Participants

A total of 445 participants completed T1 (*M* age=34.36; SD=12.46). A total of 198 participants completed T2 (*M* age=37.54; SD=13.28). T2 participants only included those who had completed T1. Participants age ranged from 18 to 74 years old at both timepoints. Due to an error when using the recruitment platform, the sample only included females. Additional socio-demographic details of participants are included in Table 1. Participants were recruited via Prolific Academic and received £3.00 (https://www.prolific.co/). All participants were required to be 18 years or older and a current resident in the

Table 1. Socio-demographic details for the sample at Timepoint 1 (T1) and Timepoint 2 (T2).

Socio-demographic details	Timepoint 1 (T1)		Timepoint 2 (T2)	
	N (%)	M (SD)	N (%)	M (SD)
Age (years old)	445 (100)	34.36 (12.46)	198 (100)	37.54 (13.28)
Ethnicity				
Black, Asian, minority ethnic groups	80 (17.98)	–	38 (19.19)	–
White	365 (82.02)	–	160 (80.81)	–
Key worker status (e.g. nurse, police)[a]				
Yes	128 (28.76)	–	52 (26.26)	–
No	317 (71.24)	–	146 (73.74)	–
Furloughed (at any timepoint)				
Yes	101 (22.70)	–	42 (21.21)	–
No	344 (77.30)	–	156 (78.79)	–
Tested positive for COVID-19 (at any time)				
Yes	36 (8.09)	–	19 (9.60)	–
No	409 (91.91)	–	179 (90.40)	–
Family/friend COVID-19 positive (at any time)				
Yes	213 (47.87)	–	105 (53.03)	–
No	232 (52.13)	–	93 (46.97)	–
Family/friend died within 28 days of COVD-19 (at any time)				
Yes	26 (5.84)	–	15 (7.58)	–
No	419 (94.16)	–	183 (92.42)	–
Have been vaccinated				
Yes	37 (8.31)	–	139 (70.20)	–
No	408 (91.69)	–	59 (29.80)	–
Will receive vaccine when available				
Yes	357 (80.22)	–	173 (87.37)	–
No/undecided	88 (19.78)	–	25 (12.63)	–

[a]Workers deemed to provide an essential service that involved leaving the household when pandemic restrictions by the UK Government were in place.

UK. Ethical approval was provided by Swansea University.

Procedure and design

Data collection for T1 commenced between February 1st and 9th 2021. At that time, the daily UK COVID-19 case rate ranged between 14,000 and 23,000 and the daily death rate ranged between 611 and 896. Approximately 500,000 people had received second dose vaccinations during T1. Participants who took part in T1 were invited to complete the same questionnaires for T2, which occurred between June 4th and 21st 2021. At that time, the daily COVID-19 case rate ranged between 6000 and 11,000 and the daily death rate ranged between 5 and 11. Between 27,000,000 and 31,000,000 people had received second doses vaccinations by T2. Information regarding deaths, hospitalisations and vaccination rates was obtained from the UK Government database tracking COVID-19 (https://coronavirus.data.gov.uk/).

The survey was hosted online using Gorilla Experiment Builder (Anwyl-Irvine et al., 2018). Participants first provided informed consent, prior to completing a demographic questionnaire that was administered to determine age, ethnicity, whether they were a key worker, had been furloughed, tested COVID-19 positive;

had a family member or friend test positive for COVID-19; lost a family member/friend to COVID-19; had been vaccinated; or intended to be vaccinated. This was followed by a battery of validated self-report measures of wellbeing including the *Patient Health Questionnaire* (PHQ-9; Kroenke et al., 2001), *Generalised Anxiety Disorder-7* (GAD-7; Spitzer et al., 2006), *Intolerance of Uncertainty Scale* (IU: Carleton et al., 2007), *Penn State Worry Questionnaire* (PSWQ; Meyer et al., 1990), *Pittsburgh Sleep Quality Index* (PSQI; Buysse et al., 1989), the *UCLA Three-Item Loneliness Scale* (Hughes et al., 2004), *Alcohol Use Disorders Identification Test* (AUDIT; Babor et al., 2001) and the *Fear of Coronavirus Questionnaire* (FCQ; Mertens et al., 2020).

Measures

The *Fear of Coronavirus Questionnaire* (FCQ; Mertens et al., 2020) is an 8-item questionnaire to measure worrying, attentional biases and avoidance behaviours of the respondent towards COVID-19. Respondents rate their level of agreement with each statement on a 5-point Likert scale (1 = 'Strongly *disagree*'; 5 = 'Strongly *agree*'). Higher scores indicate higher COVID-19 fear. The internal consistency for the FCQ was good at both T1 ($\alpha = 0.81$) and T2 ($\alpha = 0.83$).

The *Patient Health Questionnaire-9* (PHQ-9; Kroenke et al., 2001) asks participants to reflect on the past 2 weeks to assess symptoms of major depressive disorder (e.g. anhedonia, fatigue). The PHQ-9 is scored on a 4-point Likert scale (0 = not at all; 1 = several days; 2 = more than half the days; and 3 = nearly every day). A sum score is calculated, with higher scores reflecting greater levels of depression. The internal consistency was good at both T1 ($\alpha = 0.87$) and T2 ($\alpha = 0.89$).

The *Generalised Anxiety Disorder-7* (GAD-7; Spitzer et al., 2006) is a seven-item, self-report questionnaire designed to measure symptoms of Generalised Anxiety Disorder. Participants are asked to reflect on the past 2 weeks in answering the seven items, with each

item ranging from 0 (not at all) to 3 (nearly every day). Higher scores reflect greater levels of anxiety. The internal consistency for the GAD-7 was excellent at both T1 ($\alpha = 0.91$) and T2 ($\alpha = 0.92$).

The *Intolerance of Uncertainty Scale* (Carleton et al., 2007) has 12-items assessing negative beliefs about uncertainty on a 5-point Likert scale (1 = 'Not *at all characteristic of me*'; 5 = 'Entirely *characteristic of me*'). The IUS can be used as a unifactorial or a bifactorial tool. Here we used the total score which is commonly done. Internal consistency was very good at both T1 ($\alpha = 0.89$) and T2 ($\alpha = 0.91$).

The *UCLA Three-Item Loneliness Scale* (Hughes et al., 2004) was used to measure subjective feelings of loneliness. The three questions measure social connectedness, relational connectedness and self-perceived connectedness. Respondents rate each question on a scale from 1 ('*Hardly ever*'), 2 ('*Some of the time*') and 3 ('*Often*'), with higher scores indicating higher levels of loneliness. The internal consistency for the scale was very good at both T1 ($\alpha = 0.82$) and T2 ($\alpha = 0.87$).

The *Penn State Worry Questionnaire* (PSWQ; Meyer et al., 1990) was used to measure a person's tendency to worry. The PSWQ consists of 16 statements rated on a 5-point Likert scale of 1 ('*not at all typical of me*') to 5 ('*very typical of me*'). The total score is used, with higher scores indicating higher levels of worry. The internal consistency for the PSWQ was excellent at both T1 ($\alpha = 0.95$) and T2 ($\alpha = 0.95$).

The *Pittsburgh Sleep Quality Index* (PSQI; Buysse et al., 1989) contains 19 items to assess sleep quality. Items are scored along domains of subjective sleep quality, latency, duration, efficiency, disturbance, use of sleeping medication and daytime impairments. A total PSQI score represents overall sleep quality. Higher scores represent poorer sleep quality. Internal consistency for the PSQI was acceptable at both T1 ($\alpha = 0.74$) and T2 ($\alpha = 0.74$).

The *Alcohol Use Disorders Identification Test* (AUDIT; Babor et al., 2001) is a 10-item

screening tool to assess alcohol consumption, drinking behaviours and alcohol-related problems to measure alcohol consumption within the last 12 months. The AUDIT uses a rating scale ranging from 0 to 4, which is designed to measure frequency and quantity of alcohol consumed. The internal consistency for the AUDIT was good at both T1 ($\alpha = 0.78$) and T2 ($\alpha = 0.77$).

Data analysis

All analyses were conducted using JASP 0.14.1. and *R* (R Core Team, 2021). The datasets can be found on the Open Science Framework (https://osf.io/9mbw4/?view_only=614b13021ebd427991b721ce07d7a842). Responses were omitted if participants did not fully complete all items of a questionnaire or provided inconsistent socio-demographic details between timepoints. For all measures, excluding the PSQI, 445 participants were included at T1, and 198 participants were included at T2.[2] Analysis of T1 responses for the non-respondents at T2 revealed they did not significantly differ from respondents who participated in both T1 and T2 on measures of psychological wellbeing. Further details are provided in the Supplementary Analyses along with regression tables for all analyses conducted.

To identify the impact of COVID-19 fear on our measures of psychological wellbeing, we employed simple linear regressions using participants' sum COVID-19 fear scores as a predictor of each of the psychological wellbeing measures (AUDIT, GAD, IUS, PHQ, PSWQ, PSQI and UCLA) at each timepoint (T1, T2). To adjust for the inflated *false-discovery rate* associated with conducting multiple simple linear regressions, the Benjamini and Hochberg (1995) procedure was performed. To assess changes in COVID-19 fear and psychological wellbeing between T1 and T2 paired-sample *t*-tests were conducted with Benjamini-Hochberg correction using the data from participants who completed both timepoints. To determine which socio-demographic factors predicted COVID-19 fear, standard multiple regressions using COVID-19 fear scores as the outcome, and socio-demographic factors as the predictors were performed for each timepoint.

Results

COVID-19 fear and psychological wellbeing – Timepoint 1 (T1)

Table 2 displays the mean scores, standard deviations and Pearson correlation coefficients for all measures at each timepoint. To examine whether COVID-19 fear scores predicted scores on the psychological wellbeing measures at T1 simple linear regressions were performed with COVID-19 fear scores as the predictor and scores on the AUDIT (alcohol use), GAD (Generalised Anxiety Disorder), IUS (intolerance of uncertainty), PHQ-9 (depression symptoms), PSWQ (worry), PSQI (sleep quality) and UCLA (loneliness) as the outcomes. COVID-19 fear positively predicted symptoms of GAD ($F(1, 443) = 29.51$, $\beta = 0.25$, $p < 0.001$, adjusted $R^2 = 0.06$) and depression ($F(1, 443) = 19.73$, $\beta = 0.21$, $p < 0.001$, adjusted $R^2 = 0.04$), a tendency to worry ($F(1, 443) = 49.73$, $\beta = 0.32$, $p < 0.001$, adjusted $R^2 = 0.10$), sleep problems ($F(1, 437) = 25.50$, $\beta = 0.24$, $p < 0.001$, adjusted $R^2 = 0.05$), loneliness ($F(1, 443) = 6.96$, $\beta = 0.12$, $p = 0.009$, adjusted $R^2 = 0.01$) and intolerance of uncertainty ($F(1, 443) = 38.08$, $\beta = 0.28$, $p < 0.001$, adjusted $R^2 = 0.08$). COVID-19 fear scores did not predict alcohol use ($F(1, 443) = 2.52$, $\beta = -0.08$, $p = 0.11$, adjusted $R^2 = 0.00$).

COVID-19 fear and psychological wellbeing – Timepoint 2 (T2)

Table 3 displays the mean scores and standard deviations for all measures for participants who completed the survey at both T1 and T2, and the results of paired samples *t*-tests comparing scores at each timepoint. As can be in seen in Table 3, there was a significant decline in COVID-19 fear scores, depressive symptoms,

Table 2. Mean scores (standard deviations) for the measures of psychological wellbeing at T1 and T2 and the Pearson correlation coefficients between these measures at each timepoint.

Scale	n	Mean (SD)	1	2	3	4	5	6	7	8
Timepoint 1 (T1)										
COVID-19 fear (1)	445	28.03 (5.89)	–	−0.08	0.25***	0.28***	0.21***	0.32***	0.24***	0.13**
Alcohol use (2)	445	4.10 (4.02)		–	0.10*	0.01	0.13**	0.04	0.10*	0.03
Anxiety (3)	445	6.33 (5.03)			–	0.55***	0.77***	0.64***	0.45***	0.41***
Intolerance of uncertainty scale (4)	445	36.24 (8.97)				–	0.44***	0.69***	0.30***	0.31***
Depression (5)	445	7.99 (5.21)					–	0.47***	0.59***	0.53***
Worry (6)	445	53.85 (14.58)						–	0.33***	0.28***
Sleep difficulties (7)	439	7.33 (3.48)							–	0.35***
Loneliness (8)	445	5.53 (1.85)								–
Timepoint 2 (T2)										
COVID-19 fear (1)	198	24.18 (6.28)	–	−0.05	0.12	0.30***	0.06	0.23***	0.18**	0.02
Alcohol use (2)	198	3.83 (3.75)		–	0.13	−0.06	0.16*	0.03	0.11	0.04
Anxiety (3)	198	5.42 (4.83)			–	0.50***	0.79***	0.59***	0.43***	0.54***
Intolerance of uncertainty scale (4)	198	35.46 (9.23)				–	0.40***	0.68***	0.25***	0.41***
Depression (5)	198	6.26 (5.22)					–	0.42***	0.55***	0.58***
Worry (6)	198	52.54 (14.32)						–	0.29***	0.37***
Sleep difficulties (7)	195	6.42 (3.30)							–	0.31***
Loneliness (8)	198	5.21 (1.86)								–

*denotes statistical significance <0.05; ** denotes statistical significance <0.01; *** denotes statistical significance <0.001.

Table 3. Means and standard deviations for each of the psychological wellbeing measures at Timepoint 1 (T1) and Timepoint 2 (T2).

Measures	Timepoint 1		Timepoint 2		t Value	p Value	Cohen's d
	N	M (SD)	N	M (SD)			
COVID-19 fear	198	27.98 (5.79)	198	24.18 (6.28)	11.89	<0.001***	0.85
Alcohol use	198	3.80 (3.75)	198	3.83 (3.75)	−0.24	0.813	−0.02
Anxiety	198	5.97 (4.74)	198	5.42 (4.83)	1.93	0.06	0.14
Intolerance of uncertainty	198	35.96 (8.74)	198	35.46 (9.23)	0.99	0.323	0.07
Depression	198	7.29 (4.99)	198	6.26 (5.22)	3.54	0.001***	0.25
Worry	198	53.34 (14.03)	198	52.54 (14.32)	1.23	0.220	0.09
Sleep difficulties	194	7.08 (3.42)	194	6.44 (3.30)	3.27	0.001**	0.24
Loneliness	198	5.49 (1.87)	198	5.21 (1.86)	2.62	0.01*	0.19

*denotes statistical significance <0.05; ** denotes statistical significance <0.01; *** denotes statistical significance <0.001.

sleep quality and loneliness between T1 and T2. However, scores for all other measures were non-significant (all ps >0.05).

To examine whether scores on the COVID-19 fear scale could predict scores on these measures at T2, simple linear regressions were again performed. COVID-19 fear scores at T2 served as the predictor and scores on the AUDIT (alcohol use), GAD (Generalised Anxiety Disorder), IUS (intolerance of uncertainty),

Table 4. Means and standard deviations of COVID-19 fear for the socio-demographic grouping variables at Timepoint 1 and Timepoint 2.

	COVID-19 fear score	
	Timepoint 1 (T1)	Timepoint 2 (T2)
	M (SD)	M (SD)
Ethnicity		
BAME	29.33 (6.30)	24.74 (6.26)
White	27.75 (5.77)	24.04 (6.29)
Key worker (e.g. nurse, police)[a]		
Yes	27.70 (6.36)	22.87 (5.98)
No	28.16 (5.70)	24.64 (6.33)
Furloughed (at any timepoint)		
Yes	28.25 (5.24)	24.50 (5.51)
No	27.97 (6.08)	24.09 (6.48)
Tested positive for COVID-19 (at any time)		
Yes	28.42 (6.91)	23.16 (5.81)
No	28.00 (5.80)	24.29 (6.33)
Family/friend COVID-19 positive (at any time)		
Yes	28.20 (5.55)	24.86 (5.99)
No	27.88 (6.20)	23.41 (6.53)
Family/friend died within 28 days of COVD-19 (at any time)		
Yes	28.27 (5.89)	25.13 (5.94)
No	28.01 (5.90)	24.10 (6.31)
Have been vaccinated		
Yes	28.32 (5.21)	24.76 (6.14)
No	28.00 (5.96)	22.80 (6.43)
Will receive vaccine when available		
Yes	28.49 (5.43)	24.82 (6.04)
No/undecided	26.16 (7.22)	19.72 (6.12)

[a]Workers deemed to provide an essential service that involved leaving the household when pandemic restrictions by the UK Government were in place.

PHQ-9 (depression symptoms), PSWQ (worry), PSQI (sleep quality) and UCLA (loneliness) at T2, served as the outcomes. COVID-19 fear scores positively predicted intolerance of uncertainty ($F(1, 196) = 19.04$, $\beta = 0.30$, $p < 0.001$, adjusted $R^2 = 0.08$), a tendency to worry ($F(1, 196) = 10.73$, $\beta = 0.23$, $p = 0.001$, adjusted $R^2 = 0.05$) and sleep problems ($F(1, 193) = 6.80$, $\beta = 0.18$, $p = 0.01$, adjusted $R^2 = 0.03$).[3] COVID-19 fear scores did not predict any other variables (all other ps > 0.05).

Socio-demographic predictors of COVID-19 fear

Table 4 displays the mean scores and standard deviations of COVID-19 fear for each of the socio-demographic grouping variables at each timepoint. To examine which socio-demographic factors could predict COVID-19 fear at T1, a standard multiple linear regression was performed with age and each of the socio-demographic grouping variables dummy coded

and entered into the regression model. The predictor variables therefore included participants' *age (1), ethnicity (BAME vs White) [2], key worker status (Yes vs No) [3], whether they were/had been furloughed (Yes vs No) [4], whether they had tested positive for COVID-19 (Yes vs No) [5], had a family member/friend who tested positive for COVID-19 (Yes vs No) [6], had a family member/friend die within 28 days of testing positive for COVID-19 (Yes vs No) [7], had received a vaccine (Yes vs No) [8] or intended to be vaccinated (Yes vs No/ Undecided) [9]*. The outcome variable was participants' COVID-19 fear scores at T1. The regression model was significant $F(9, 435) = 2.90$, $p < 0.01$, adjusted $R^2 = 0.04$. Significant predictors included Age ($\beta = 0.12$, $p = 0.013$), Ethnicity ($\beta = 0.15$, $p = 0.002$) and Vaccine intention (i.e. whether participants would receive the vaccine when available to them; $\beta = 0.18$, $p < 0.001$). That is, the model revealed that older participants, members of the BAME community and those who intended to receive the vaccine were more likely to report higher COVID-19 fear. All other predictors were non-significant (smallest $p = 0.36$).

An identical multiple regression was also performed with the same variables at T2. The regression model was significant, $F(9, 188) = 2.49$, $p < 0.05$, adjusted $R^2 = 0.06$. The only significant predictor was vaccine intention, with those who intended to receive the vaccine being more likely to report higher COVID-19 fear than those who did not ($\beta = 0.26$, $p < 0.01$). All other predictors were non-significant (smallest $p = 0.15$).

Discussion

The current study longitudinally assessed the impact of COVID-19 fear on psychological wellbeing at two distinct timepoints during the pandemic in the UK. T1 (February 2021) took place nearly 2 weeks after the highest number of COVID-19 deaths and hospitalisations in the UK during the pandemic (to date). T2 (June 2021) took place approximately 4 months later when the number of deaths and hospitalisations

had declined considerably, and most of the sample had been vaccinated. At T1, COVID-19 fear predicted elevated levels of anxiety, depression, intolerance of uncertainty, worry, sleep quality and loneliness. At T2, there was a significant reduction in COVID-19 fear, depression, loneliness and sleep quality. However, COVID-19 fear continued to predict elevated levels of intolerance of uncertainty, worry and sleep quality. Socio-demographic predictors of COVID-19 fear at T1 included age, ethnicity and vaccine intention. At T2, only vaccine intention predicted COVID-19 fear. Taken together, these findings demonstrate the significant toll of COVID-19 fear on psychological wellbeing and highlight the potential pathways by which it might continue to impact psychological wellbeing as we emerge from the pandemic.

The findings at T1 are consistent with previous studies which have demonstrated that the pandemic has resulted in elevated levels of anxiety, depression, stress, worry, sleep quality, intolerance of uncertainty and loneliness in the UK and other countries (Arora et al., 2022; Bakioğlu et al., 2021; Daly et al., 2020; Erbiçer et al., 2021; Hidaka et al., 2021; Jahrami et al., 2021). Given that T1 was administered following one of the most challenging times during the pandemic (based on number of deaths) it is likely the impact of COVID-19 fear was also heightened at this time, which might explain why COVID-19 fear impacted on nearly all our measures of wellbeing at T1. Interestingly, alcohol use was the only health and wellbeing measure which was not influenced by COVID-19 fear at T1. This unexpected finding may be partly explained by the younger age of our sample leading to reduced social opportunities for drinking (Lee et al., 2020; Steffen et al., 2021).

The findings at T2 somewhat differ from previous studies which have longitudinally assessed the impact of COVID-19 on psychological wellbeing. Previously, the impact of the pandemic on wellbeing has persisted across timepoints or increased at a later timepoint in the pandemic (Daly et al., 2020; Hidaka et al., 2021; Knowles et al., 2022). However, these

studies have collected data at similar timepoints during the pandemic (e.g. when similar restrictions have been in place). In the current study, the impact of COVID-19 fear reduced between the two timepoints. This is understandable given that T2 was administered when the number of deaths and the impact of the virus decreased considerably from T1, and much of the sample were vaccinated. Crucially, however, despite the change in circumstances at T2, COVID-19 fear continued to predict IU, worry and sleep quality, thus highlighting the long term effects of COVID-19 fear on psychological wellbeing.

Uncertainty has become a hallmark feature of the pandemic due to changing government restrictions, fluctuations in case numbers, deaths and hospitalisations and the threat of new virus variants. Thus, it is perhaps unsurprising that COVID-19 fear continued to predict IU at T2 despite the decline in deaths and the increase in vaccinations. The fact that COVID-19 fear continued to predict worry and sleep at T2 is also not surprising given the serious implications of any changes in the spread and severity of the virus (e.g. infection of self or loved ones) and changes to government policies and guidance (e.g. being furloughed, cancellation of activities). These findings have important implications as they show that whilst COVID-19 fear reduces when circumstances appear to improve, the uncertainty and worry prompted by the pandemic is more resistant to change and may result in poorer sleep quality. As such, returning to pre-pandemic behaviours may take time for individuals with high levels of COVID-19 fear and should be considered by national governments' public health policies as the world emerges from the pandemic.

The socio-demographic predictors of COVID-19 fear at T1 were consistent with the findings of Niño et al. (2021), with both age and being a member of the BAME population being positively associated with COVID-19 fear. These findings might be expected given that older populations and members of the BAME population are at greater risk of infection and death from COVID-19 (Aldridge et al., 2020;

Yanez et al., 2020). However, they are inconsistent with the findings of other studies (Breakwell et al., 2022; Cerda and García, 2022). At T1 we also found that those who intended to receive the vaccine were more likely to report higher COVID-19 fear than those who did not intend to receive the vaccine. This is likely to be explained by the fact those who did not intend to receive the vaccine may not have felt threatened or at risk from the virus (Grüner and Krüger, 2021; Mertens et al., 2022). Interestingly, at T2 vaccine intention remained a predictor of COVID-19 fear, however, age and ethnicity did not. This might suggest that the vaccine provided protection from the elevated COVID-19 fear older and BAME populations experienced at T1.

The present study had some limitations. Due to a programming error with the online recruitment platform, the sample only included females. Given that females also report higher levels of anxiety, depression (Jenkins et al., 2021) and COVID-19 fear (Reznik et al., 2021), this may have inflated the effects of COVID-19 fear and thus prevent generalising these results to males (cf. Erbiçer et al., 2021). However, the impact of COVID-19 fear on psychological wellbeing during the pandemic in females is important to understand, particularly if females do indeed report higher COVID-19 fear. The variability in sample age and the relatively high attrition rate may also influence the findings. Notably, the attrition rate could have been impacted by the number of COVID-19 deaths and infections at T1, although other logistical factors (i.e. payment upon completion of T2) will also have had an impact. A lack of pre-pandemic baseline measures may also limit interpretation of the impact of COVID-19 fear. However, the absence of a baseline measure is typical of COVID-19 studies and the critical comparison in the current study was between the two timepoints. Other changes that may have occurred between T1 and T2 such as changes in psychological resilience and strengthened family and social support may also have contributed to the findings though. Future research should therefore examine the

gender specificity of these findings and the underlying mechanisms governing the impact of COVID-19 fear on wellbeing.

In conclusion, this study provides evidence of the long-term impact of COVID-19 fear on psychological wellbeing at two distinct timepoints during the UK and highlights the pathways by which COVID-19 fear might continue to impact psychological wellbeing as we emerge from the pandemic.

Data sharing statement

The dataset for this study (which includes de-identified participant data) is available in the Figshare repository and as Supplemental Material via the SAGE Journals platform and the Open Science Framework: https://osf.io/9mbw4/?view_only=614b 13021ebd427991b721ce07d7a842

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Notes

1. We use the term 'BAME' to be consistent with the literature.
2. A further six participants did not complete the PSQI at Timepoint 1, leaving a total of 439 participants. Three participants did not fully complete the PSQI at Timepoint 2, leaving a total of 195. One participant provided a response for the PSQI at T2 but did not provide a response at T1 meaning that for PSQI comparisons between T1 and T2, $N=194$.
3. COVID-19 fear at T1 also positively predicted intolerance of uncertainty, worry and sleep problems at T2 (see Supplementary Analyses).

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