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Information seeking, mental health and loneliness: Longitudinal analyses of adults in the UK COVID-19 Mental Health & Wellbeing study

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Highlights

Women, older and higher socioeconomic group individuals reported higher levels of information-seeking during the COVID-19 pandemic.

The majority of participants reported that they sought information on Covid 1-5 times per day during the early stages of the pandemic.

Higher levels of information-seeking were associated with poorer mental health outcomes, particularly clinically significant levels of anxiety.

Reducing or managing information-seeking behaviour may be one method to reduce anxiety during pandemics and other public health crises.

Abstract

Information-seeking has generally been seen as an adaptive response to the COVID-19 pandemic. However, it may also result in negative outcomes on mental health. The present study tests whether reporting COVID-related information-seeking throughout the pandemic is associated with subsequently poorer mental health outcomes. A quota-based, non-probability-sampling methodology was used to recruit a nationally representative sample. COVID-related information-seeking was assessed at six waves along with symptoms of depression, anxiety, mental wellbeing and loneliness (N = 1945). Hierarchical linear modelling was used to assess the relationship between COVID-related information-seeking and mental health outcomes. Information-seeking was found to reduce over time. Overall, women, older and higher socioeconomic group individuals reported higher levels of information-seeking. At waves 1-4 (March-June 2020) the majority of participants reported that they sought information on Covid 1-5 times per day, this decreased to less than once per day in waves 5 and 6 (July-November 2020). Higher levels of information-seeking were associated with poorer mental health outcomes, particularly clinically significant levels of anxiety. Use of a non-probability sampling method may have been a study limitation,

nevertheless, reducing or managing information-seeking behaviour may be one method to reduce anxiety during pandemics and other public health crises.

Introduction

The COVID-19 pandemic has involved a huge amount of information being shared by governments and public health agencies in order to keep people informed about health promoting behaviours to reduce the spread of COVID-19 (e.g., social and physical distancing, handwashing), to provide regular updates on government restrictions and lockdowns, and to allow populations to have access to clear and reliable COVID-related news (Liu, 2020; Naeem & Bhatti, 2020). This information has come from a variety of sources including through television and newspapers, online via search engines such as Google and via social media, as well as in person via friends and family (Statista, 2020; Tran et al., 2020). Google Trends data also demonstrated a particular spike in COVID-19 information seeking in March 2020 in the United States of America (Mangono et al., 2021). Moreover, one early study showed that many individuals consumed their COVID-19 information through the internet, online newspapers and social networks (e.g., Tran et al., 2020).

While information seeking has been adaptive in order to keep up to date with the latest information regarding the pandemic and initial data showed that specific up-to-date and accurate health information was related to lower levels of stress, anxiety and depression (Wang et al., 2020), it does not always result in positive outcomes. It can be difficult for people to evaluate accurate information when trying to deal with the deluge of information. Information seeking can also be a reassurance seeking behaviour aimed at reducing health-related fears and is particularly common where there is uncertainty about information presented in the media related to a specific topic (Guillaume & Bath, 2004). However, a high-level of information seeking can be associated with higher health anxiety (McMullan et al., 2019; Jagtap, Shamblaw, Rumas & Best, 2021) and it is suggested that it can actually increase anxiety due to negative reinforcement (Starcevic & Berle, 2013). Relatedly, previous research has also shown that media messaging about infectious diseases can

increase perceptions of public risk and anxiety (Sell et al., 2017). Moreover, extrapolating from work conducted during the Ebola and H1N1 outbreaks suggests that repeated exposure to the crisis (and associated information) during the COVID-19 pandemic may have led to increased anxiety and elevated stress responses that may lead to future negative health effects (Thompson, Garfin, Holman & Silver, 2017; Garfin, Silver and Holman 2020). Indeed, COVID-related information seeking has been found to be associated with obsessive-compulsive symptoms (Loosen, Skvortsova & Hauser, 2021) and other mental health problems (Gao et al., 2020). Additionally, greater COVID-related information seeking is related to an increase in pandemic-related preventative health behaviours such as hand washing (Liu, 2020). It is also related to a decline in other health-related searches (e.g., doctors' appointments; Mangono et al., 2021) and associated with increased distress which is subsequently associated with reduced adherence to preventative measures (Siebenhaar, Kother & Alpers, 2020)

In this paper, we report data from the UK COVID-19 Mental Health and Wellbeing study, a longitudinal, national survey that ran from March 2020 to July 2021. The present study focused on information seeking across the six waves of the study and whether it was related to symptoms of depression, anxiety, and wellbeing, as mental health outcomes, together with loneliness.

Methods

Participant recruitment was conducted by Taylor McKenzie, a social research company. A non-probability sample of adults (aged 18 years or older) was recruited from across the UK to the UK COVID-19 Mental Health & Wellbeing study (UK COVID-19-MH), with a longitudinal study design. UK COVID-19-MH has been detailed previously (O'Connor et al., 2020b; 2022) and the main research questions were preregistered at AsPredicted.org (#41910).

Between 31st March and November 2020, members of an existing online UK panel (Panelbase.net) were invited by email to take part in an online survey on health and wellbeing. At wave 1, 7471 panel members were invited to take part and 3077 were included in the final sample (target sample was n=3,000). A quota sampling methodology was employed, with quotas based on age (18–24 years: 12%; 25–34: 17%; 35–44: 18%; 45–54: 18%; 55–64: 15%; ≥65: 20%), gender (women: 51%; men: 49%), socioeconomic grouping (SEG ; assessed via The National Readership Survey social grade; AB:27%; C1: 28%; C2: 20%; DE: 25%, based on occupation, where A, B and C1 are higher and categories C2, D, E are lower) and region of the UK (12 regions). The panel has approximately 300,000 registered adult members and of those invited, 4394 did not take part in the survey. The majority were screened out as a particular quota was full (n=3527) and the remainder dropped out (n=867).

The first three waves occurred within the first 6 weeks of the UK lockdown, and the subsequent three waves were roughly every 2 to 3 months, with the interval between waves increasing over time. The survey included questions on a wide range of psychological and social measures along with questions about COVID-19. In this paper we test whether reporting COVID-related information seeking is associated with poorer mental health outcomes. As outlined above and in our previous work (O'Connor et al., 2022), a total of 3077 adults completed the survey at wave 1. Findings for waves 1 (31 March to 9 April 2020) to 6 (1st October to – 4th November 2020) are reported in the current paper. At wave 2, 89% of participants (n = 2742) completed the survey, 85% (n = 2604) completed wave 3, 77.5% (n = 2384) completed wave 4, 69.7% (n = 2144) completed wave 5 and 74.2% (n = 2283) completed wave 6. 1945 (63.2%) participants completed all six waves of the study.

Ethical approval

Participants provided written informed consent online. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant

national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures involving human subjects/patients were approved by the University of Glasgow's Medical, Veterinary & Life Sciences Ethics Committee (approval number: 200190146) and participants consented for their data to be used in the research. Participants received £1.50 for the completion of each survey and were entered into prize draws.

Measures

Information seeking was assessed using a single item ("How often do you actively seek out information on COVID-19: Less than once a day; 1-5 times a day; 6-10 times a day; 11-20 times a day; 21-50 times a day; 50+times per day). Given the time urgency, this measure was devised by an expert panel of highly experienced researchers and considered to have good face validity. Moreover, similar measures have been used to assess frequency of information seeking in relation to a range of different health behaviours (e.g. Neumark et al., 2013; Jia, Pang & Liu, 2021).

Depressive symptoms were assessed via the nine-item Patient Health Questionnaire (PHQ-9 ; Löwe, Kroenke, Herzog, & Gräfe, 2004; Kroenke & Spitzer, 2002). The 7-item Generalized Anxiety Disorder (GAD-7; Spitzer, Kroenke, Williams & Lowe, 2006) tool was used to assess symptoms of generalised anxiety disorder. Both measures ask how often symptoms have been bothering the respondents in the past 2 weeks on a scale of 0 (not at all) to 3 (nearly every day). Cronbach's alpha for the scales in the current sample ranged from .90 to .93, and .92 to .94, respectively. Scores range from 0-27 on the PHQ-9 and 0-21 on the GAD-7, with higher scores indicating higher levels of depression and anxiety. Scores of≥10 on both measures are thought to indicate clinically significant cut-offs as indicators of at least moderate levels of depression and anxiety (Kroenke & Spitzer, 2002; Spitzer Kroenke, Williams & Lowe, 2006).

Mental wellbeing was assessed via the 7-item Short Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS; Fat et al., 2017). Participants were asked to respond about their experiences over the last 2 weeks on a 1 (none of the time) to 5 (all the time) scale. Cronbach's alphas for the scale in the current sample ranged from .89 to .92. Scores range from 7-35 with a higher score indicating better mental wellbeing. A score of 19.3 is thought to indicate low levels of mental wellbeing and is used as a clinically significant cut-off (Fat et al., 2016).

Loneliness was measured using the UCLA 3-item loneliness scale (Hughes, Waite, Hawkley & Cacioppo, 2004). Participants were asked to respond about their experiences over the last 2 weeks on a three-point scale (hardly ever, some of the time, often). Scores ranged from 3-9 where a higher score indicates greater loneliness. Cronbach's alphas for the scale in the current sample ranged from .88 to .90. To our knowledge, there are no published clinically significant cut-offs for this measure, we therefore conducted a median split on the data and treated any scores above the median as indicative of high loneliness.

To assess mental health status, participants were asked to indicate whether they had any mental health conditions, neuro-divergent disorders or alcohol/drug problems. To assess physical health status, participants were asked to indicate whether they had existing physical health conditions (e.g., diabetes, cancer, heart disease).

Analyses

Analyses were conducted in SPSS v.25 and multilevel models were conducted in HLM 7 (Raudenbush et al., 2011). We assessed how mental health outcomes and loneliness changed over the waves of the study along with whether information seeking differed by demographic characteristics (age, SEG, gender). Finally, we assessed whether information seeking was associated with mental health outcomes (depression, anxiety, wellbeing) and

loneliness. Analyses were performed on the 1945 individuals who completed all six waves of the survey.

Hierarchical linear modelling was used to assess the relationship between COVID-related information seeking and mental health (depression, anxiety and wellbeing) and loneliness scores. The data were considered to have a two-level hierarchical structure. Level 1 variables (COVID-related information seeking, levels of depression, anxiety, mental wellbeing and loneliness at each wave) were group mean centred. Level 2 variables (gender (female, male), age (under and equal to 30, over 30), physical and mental health status (any mental health conditions reported: no/yes; any physical health conditions reported: no/yes), socioeconomic group (SEG): high (A + B + C1) vs. low (C2 + D + E)) were uncentred as they were dichotomous variables. The level 1 variables were modelled as random as we assumed that each of the within-person variables would vary from wave to wave. The level 2 variables were assumed to be fixed. For all the models tested here, an unrestricted level 1 variance-covariance structure was assumed. The main analyses were conducted in two blocks. First, we examined whether COVID-related information seeking was associated with each of the mental health and wellbeing outcomes (over the past 2 weeks) across the 6 waves. In these analyses, gender, age, SEG, whether participants had an existing mental health or physical health condition, and whether they lived alone or not were entered as covariates. Wave was also entered as a control variable in all analyses. Second, we explored whether the effects of COVID-related information seeking on mental health and loneliness were moderated by mental health status. Third, these analyses were repeated using the clinical cut-off to indicate high levels of depression, anxiety and loneliness and low levels of wellbeing using hierarchical Bernoulli models. Depression, anxiety and wellbeing scores were converted into a binary categorization based on previously published clinically meaningful cut-offs (scores of 10+ on the PHQ and GAD indicate moderate or severe levels of depression and anxiety; scores of 19.3 or less on the SWEMWBS indicate low wellbeing).

Results

Covid-related information seeking and mental health outcomes

Information seeking over time

From waves 1-4, the majority of participants reported that they sought information on Covid 1-5 times per day (see Table 1). During waves 5-6, the majority of participants reported that they sought information less than once per day, suggesting that information seeking reduced over time. The proportions of participants reporting information seeking more than 6 times per day also reduced over time, with the highest at wave 1 and lowest at wave 5.

Information seeking by participant characteristics

Chi squared analyses were conducted to assess the relationship between age, gender and SEG on information seeking over the six waves. There was a significant relationship between SEG and information seeking at waves 1, 2, 3, 5, and 6 (all $p<.02$) where people with high SEG occupations were more likely to report greater information seeking compared to people with low SEG occupations. There was a significant relationship between gender and information seeking at waves 3-6 (all $p<.001$), with women reporting greater information seeking than men. Finally, there was a significant relationship between age and information seeking at waves 2, 3, 4 and 6, with older individuals (aged over 30) reporting greater information seeking compared to participants under 30 (all $p<.02$).

Is Covid-related information seeking associated with mental health outcomes across the six waves?

The results of the hierarchical linear models found that there were significant positive associations between COVID-related information seeking and depression (Table 2; unadjusted, $\beta = .25$, $p = .001$; adjusted, $\beta = 0.25$, $p = .001$) and anxiety (unadjusted, $\beta = .22$,

p<.001; adjusted, β = .22, *p* < .001) and a negative association between COVID-related information seeking and wellbeing (unadjusted, β = -.26, *p*<.001; adjusted, β = -.26, *p* < .001) and a positive association with loneliness (unadjusted, β = .05, *p*=.026; adjusted, β = .05, *p* = .026). The results showed that higher levels of COVID-related information seeking were associated with higher levels of depression, anxiety and loneliness and lower wellbeing across the 6 waves

Is Covid-related information seeking associated with clinically meaningful mental health outcomes?

The results of the hierarchical Bernoulli models found that there were significant positive associations between COVID-related information seeking and clinically meaningful levels of depression (unadjusted, Odds Ratio = 1.14, 95% CI 1.014,1.280; adjusted, Odds Ratio = 1.09, 95% CI 1.014,1.280), anxiety (unadjusted, Odds Ratio = 1.21, 95% CI 1.066,1.375; adjusted, Odds Ratio = 1.17, 95% CI 1.066,1.375) and wellbeing (unadjusted, Odds Ratio = 1.12, 95% CI 1.003,1.248; adjusted, Odds Ratio = 1.12, 95% CI 1.003,1.248). The association between COVID-related information seeking and clinically meaningful levels of loneliness were not statistically significant (Table 3).

Are the effects of COVID-related information seeking moderated by current mental health status?

Mental health status did not significantly moderate the relationship between COVID-related information seeking and any of the mental health outcomes or loneliness (See Supplementary Table 1).

Discussion

The general trend in the data was that information seeking declined over time, peaking at the earliest stages of the pandemic (waves 1 and 2; March- April 2020) with the

majority of participants reporting they sought information between one and five times per day. By wave 5 (July-August 2020), the majority of participants reported that they sought information less than once a day. Nevertheless, information seeking was found to be related to all three mental health outcomes where higher levels of information seeking were associated with greater depression and anxiety scores and lower wellbeing.

Information seeking was also found to differ by participant demographics, with older participants, women and those from higher socioeconomic groups reporting greater information seeking. In addition, individuals reporting higher levels of information seeking were more likely to also report mental health outcomes that were at or above the clinically meaningful thresholds. In particular, high levels of information seeking were associated with the clinical threshold for moderate or severe anxiety on the GAD.

The current findings are consistent with other work that has explored the adverse effects of information seeking and exposure to media messaging during public health crises (Thompson, Garfin, Holman & Silver, 2017; Garfin, Silver and Holman, 2020). Previously reported negative effects have included increased psychological distress which may have widespread impacts, including future mental health problems (e.g., Starcevic & Berle, 2013; Gao et al., 2020; Loosen, Skvortsova & Hauser, 2021) as well as potentially reducing compliance with preventative health behaviours (Siebenhaar, Kother & Alpers, 2020). Moreover, these current findings are in line with other studies conducted during the COVID-19 pandemic and have important implications for future pandemics. For example, Loosen, Skvortsova and Hauser (2021) found evidence that COVID-related information seeking was associated with increases in obsessive-compulsive symptoms and underlined the importance of closely monitoring the public's mental health during public health crises (Loosen, Skvortsova & Hauser, 2021). Similarly, Goa et al. (2020) found high prevalence of mental health problems, in particular, anxiety and depression, to be associated with high social media usage in individuals during the COVID-19 outbreak. Wang et al (2021), in a

large study of seven middle-income countries in Asia, also found that spending less time on health information was a protective factor for mental health. Taken together, there is a clear need for governments and health agencies to consider strategies to help mitigate the negative effects of the “infodemic” which often arises during public health emergencies.

How might high levels of information seeking about COVID-19 lead to adverse mental health outcomes? Evidence from other public health crises and traumatic events show that in cases of uncertainly, where information is unknown or badly communicated, exposure to this information can trigger heightened appraisals of threat, which lead to feelings of uncontrollability and increased levels of anxiety (Garfin et al., 2020; Taha, Matheson & Anisman, 2014). This is likely to be the case during the COVID-19 pandemic, particularly during the early stages before a vaccine had become viable and the future remained entirely uncertain (O’Connor et al., 2020; 2022). In another earlier example, during the Ebola outbreak in 2014, a study in the United States (where risk levels were low) found that higher levels of exposure to Ebola-related stories were associated with increased worry, distress and impaired functioning (Thompson et al., 2017).

It has also been shown that the amount and type of media exposure can negatively affect psychological distress following publicly traumatic events. For example, following the Boston Marathon bombings, individuals who had spent a large amount of time exposed to bombing-related media reported greater acute stress symptoms, with future exposure to these kind of events creating a cycle of distress (Garfin et al., 2020; Holman, Garfin & Silver, 2014). Moreover, the same research team found that exposure to particular types of media also made a difference, such that exposure to graphic images (i.e., that included blood) was associated with elevated posttraumatic stress and fear 6 months after the bombings. Therefore, it is likely that the amount, type and often-graphic nature of media exposure will have contributed to the associations between COVID-19 information-seeking and psychological distress observed in the current study. Unfortunately, given the time urgent

nature of setting up studies early in the pandemic together with the need to reduce participant burden, it was not possible to collect information on the different sources of information sought by participants. However, as outlined above, badly communicated, uncertain and graphic information may have had a particularly adverse effect on mental health outcomes during COVID-19 pandemic.

This study also found that COVID related information seeking was also associated with higher levels of loneliness (while controlling for whether participants lived alone or not), although the association was small and did not translate into a meaningful clinical cut-off for loneliness. It is clear from recent meta-analytical findings that there were small, but robust increases in loneliness during the pandemic (Ernst et al., 2022). However, less is known about the psychological and behavioural factors that are associated with changes in loneliness levels. Therefore, the current finding is important as it suggests that information seeking may play a role in helping improving our understanding of individual differences in loneliness during times of uncertainty and risk.

Overall, the present research demonstrates that information seeking is associated with poorer mental health outcomes. Implications of this work suggest that management of information seeking behaviour may be one method to reduce anxiety and improve wellbeing during situations that involve large amounts of information sharing. Another method might be to target repetitive thinking such as worry and rumination likely triggered by information seeking. A recent meta-analysis has identified a number of useful interventions that can reliably reduce worry and rumination. For example, techniques that encourage individuals to challenge their thinking style, to disengage from the emotional responses brought on by worry or rumination as well as mindfulness-based approaches should be considered (McCarrick et al. 2021, see also Prudenzi et al., 2022). Additionally, due to the sheer amount of information from differing sources, of varying validity, that is available, it is difficult for people to know what sources of information to rely on or trust. It is also important that health

authorities and governmental organisations provide clear information during these situations in order to reduce potential uncertainty that can stem from the varying quality of information available online. However, the current findings suggest that public health agencies should encourage members of the public to limit their information seeking and to have regular breaks from media and messaging. Future research might also usefully investigate the extent to which high levels of information seeking may contribute to 'pandemic fatigue' and emerging work on COVID-19 burnout and burnout more broadly (Al-Ghunaim et al., 2021; Wang et al., 2021).

Finally, we recognise that strengths and limitations of the present study include that the study is likely to have under-recruited individuals with particularly poor mental health outcomes and the use of a non-probability, quota-based sampling method is a shortcoming as not all members of the population had a chance to participate, and this may limit the generalisability of the findings. Nevertheless, it is important to note that utilisation of this sampling approach allowed us to ensure we recruited a nationally representative sample. The study also relies on self-reported outcomes including a single item measure of information seeking, though, it is worth noting that this measure was devised by a panel of experts, is similar other measures and has good face validity. Additionally, we do not know the direction of causality and whether poorer mental health causes greater information seeking, or information seeking causes poorer mental health. Despite this, the study recruited a relatively large, quota-based sample and is able to report the relationship between the key variables over a substantial period of time.

In conclusion, the results of the current study show that information seeking during the COVID-19 pandemic was related to poorer mental health outcomes. The results were particularly pronounced for anxiety. Reducing or managing information seeking behaviour may be one method to reduce anxiety during situations involving large amounts of information sharing, such as pandemics and future public health crises.

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Table 1. Information seeking and mental health scores across the six waves (N=1945)

	Wave 1 31 Mar-9 Apr	Wave 2 10 Apr-27 Apr	Wave 3 28 Apr-11 May	Wave 4 27 May-15 Jun	Wave 5 17 Jul-7 Aug	Wave 6 1 Oct-4 Nov
Mean (SD)						
Info seeking; N (%)						
Less than 1x per day	449 (23.1)	501 (25.8)	610 (31.4)	805 (41.4)	1049 (53.9)	972 (50.0)
1-5 times a day	1240 (63.8)	1199 (61.6)	1139 (58.6)	1004 (51.6)	778 (40.0)	856 (44.0)
6-10 times a day	167 (8.6)	169 (8.7)	142 (7.3)	96 (4.3)	84 (4.3)	88 (4.5)
11-20 times a day	60 (3.1)	53 (2.7)	28 (1.4)	26 (1.3)	25 (1.3)	22 (1.1)
21-50 times a day	16 (0.8)	12 (0.6)	15 (0.8)	9 (0.5)	6 (0.3)	5 (0.3)
50+ times per day	13 (0.7)	11 (0.6)	11 (0.6)	5 (0.3)	3 (0.2)	2 (0.1)
Depression	5.6 (6.25)	5.49 (6.11)	5.54 (6.28)	5.25 (6.04)	5.24 (6.23)	5.38 (6.32)
Anxiety	4.9 (5.21)	4.71 (5.18)	4.55 (5.24)	4.37 (5.20)	4.28 (5.55)	4.42 (5.22)
Wellbeing	22.78 (6.13)	23.01 (6.23)	23.15 (6.23)	23.54 (6.38)	23.53 (6.45)	23.34 (6.41)
Loneliness	5.11 (1.92)	5.10 (1.92)	5.08 (1.92)	5.06 (1.94)	5.03 (1.93)	5.01 (1.95)

Figure 1. Information seeking over the six study waves (N=1945)

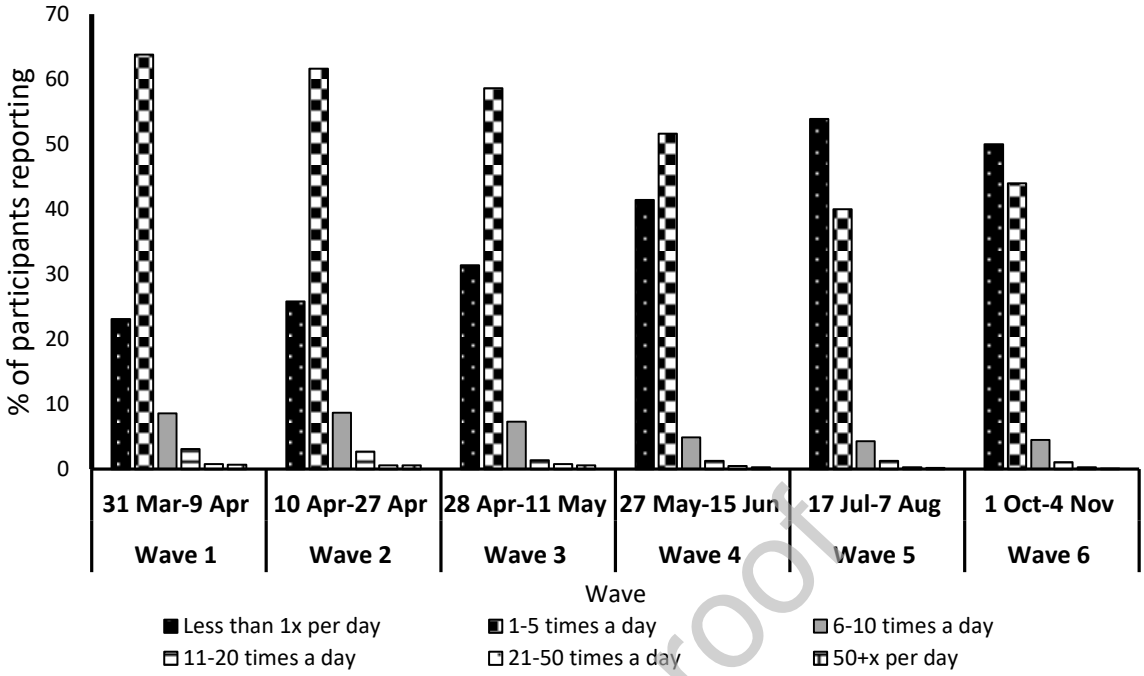

Table 2. Effects of COVID-related information seeking on depression, anxiety, wellbeing, and loneliness across the six waves

	Unadjusted					Adjusted for covariates				
		Coeff	**SE**	***d.f.***	***P* value**		**Coeff**	**SE**	***d.f.***	***P* value**
Depression										
Intercept	β_{00}	4.51	0.13	1942	<0.001	β_{00}	5.86	0.75	1936	<0.001
Physical health status	β_{01}	--	--	--	--	β_{01}	-0.16	0.28	1936	0.555
Gender	β_{02}	--	--	--	--	β_{02}	-0.04	0.26	1936	0.884
SEG	β_{03}	--	--	---	---	β_{03}	-0.43	0.26	1936	0.098
Mental health status	β_{04}	--	--	--	--	β_{04}	0.18	0.30	1936	0.547
Age	β_{05}	--	--	--	--	β_{05}	0.15	0.33	1936	0.650
Living alone or not	β_{06}	--	--	---	---	β_{06}	-0.34	0.34	1936	0.321
Level 1 slope										
Info seeking – depression	β_{10}	0.25	0.08	1942	0.001	β_{10}	0.25	0.08	1942	0.001
Level 1 slope										
Wave - depression	β_{20}	-0.03	0.02	1942	0.079	β_{20}	-0.04	0.02	1942	0.080
Anxiety										
Intercept	β_{00}	4.53	0.11	1942	<0.001	β_{00}	4.39	0.64	1936	<0.001
Physical health status	β_{01}	--	--	--	--	β_{01}	-0.20	0.23	1936	0.399
Gender	β_{02}	--	--	--	--	β_{02}	0.11	0.22	1936	0.612
SEG	β_{03}	--	--	---	--	β_{03}	-0.24	0.22	1936	0.267
Mental health status	β_{04}	--	--	--	--	β_{04}	0.22	0.25	1936	0.380
Age	β_{05}	--	--	--	--	β_{05}	0.20	0.28	1936	0.488
Living alone or not	β_{06}	--	--	---	---	β_{06}	-0.19	0.29	1936	0.505
Level 1 slope										
Info seeking – anxiety	β_{10}	0.22	0.06	1942	<0.001	β_{10}	0.22	0.06	1942	<0.001
Level 1 slope										
Wave – anxiety	β_{20}	-0.09	0.02	1942	<0.001	β_{20}	-0.09	0.02	1942	<0.001
Wellbeing										
Intercept	β_{00}	23.23	0.13	1942	<0.001	β_{00}	22.87	0.77	1936	<0.001
Physical health status	β_{01}	--	--	--	--	β_{01}	0.09	0.28	1936	0.742
Gender	β_{02}	--	--	--	--	β_{02}	-0.23	0.26	1936	0.378
SEG	β_{03}	--	--	---	--	β_{03}	0.39	0.26	1936	0.135
Mental health status	β_{04}	--	--	--	--	β_{04}	-0.49	0.30	1936	0.105
Age	β_{05}	--	--	--	--	β_{05}	0.14	0.34	1936	0.135

Living alone or not	β_{06}	--	--	---	---	β_{06}	-0.03	0.35	1936	0.930
Level 1 slope										
Info seeking – wellbeing	β_{10}	-0.26	0.06	1942	<0.001	β_{10}	-0.26	0.07	1942	<0.001
Level 1 slope										
Wave – wellbeing	β_{20}	0.11	0.02	1942	<0.001	β_{20}	0.11	0.02	1942	<0.001
Loneliness										
Intercept	β_{00}	5.06	0.04	1942	<0.001	β_{00}	5.01	0.34	1936	<0.001
Physical health status	β_{01}	--	--	--	--	β_{01}	-0.01	0.09	1936	0.928
Gender	β_{02}	--	--	--	--	β_{02}	0.09	0.08	1936	0.296
SEG	β_{03}	--	--	---	--	β_{03}	-0.06	0.08	1936	0.437
Mental health status	β_{04}	--	--	--	--	β_{04}	0.15	0.09	1936	0.103
Age	β_{05}	--	--	--	---	β_{05}	-0.01	0.11	1936	0.942
Living alone or not	β_{06}	--	--	---	---	β_{06}	-0.09	0.11	1936	0.396
Level 1 slope										
Info seeking – loneliness	β_{10}	0.05	0.02	1942	0.026	β_{10}	0.05	0.02	1942	0.026
Level 1 slope										
Wave – loneliness	β_{20}	-0.02	-0.01	1942	0.004	β_{20}	-0.02	0.01	1942	0.004

Table 3. Effects of COVID-related information seeking on clinically meaningful cut-offs for depression, anxiety, wellbeing and loneliness across the six waves

		Unadjusted							Adjusted for covariates						
		OR	**95% CI**	**Coeff**	**SE**	***d.f.***	***P* value**		**OR**	**95% CI**	**Coeff**	**SE**	***d.f.***	***P* value**
Depression														
Intercept	β_{00}	0.15	(0.136,0.171)	-1.88	0.06	1942	<0.001	β_{00}	0.18	(0.087,0.353)	-1.74	0.36	1936	<0.001
Physical health status	β_{01}	--	--	--	--	--	--	β_{01}	0.91	(0.704,1.174)	0.01	0.11	1936	0.466
Gender	β_{02}	--	--	--	--	--	--	β_{02}	0.96	(0.754,1.219)	-0.04	0.12	1936	0.729
SEG	β_{03}	--	--	--	--	---	---	β_{03}	0.78	(0.611,0.987)	-0.25	0.12	1936	0.039
Mental health status (MH)	β_{04}	--	--	--	--	--	--	β_{04}	1.11	(0.847,1.459)	0.11	0.14	1936	0.445
Age	β_{05}	--	--	--	--	--	--	β_{05}	1.18	(0.864,1.606)	0.16	0.16	1936	0.299
Living alone or not	β_{06}	--	--	--	--	---	---	β_{06}	0.91	(0.666,1.251)	-0.09	0.16	1936	0.570
Level 1 slope														
Info seeking – depression	β_{10}	1.14	(1.014,1.280)	0.13	0.06	1942	0.029	β_{10}	1.09	(1.014,1.280)	0.13	0.06	1936	0.029
Level 1 slope														
Wave – depression	β_{20}	0.97	(0.940,1.011)	-0.02	0.02	1942	0.164	β_{20}	0.98	(0.940,1.011)	-0.03	0.02	1936	0.164
Anxiety														
Intercept	β_{00}	0.09	(0.086,0.110)	-2.33	0.06	1942	<0.001	β_{00}	0.08	(0.037,0.159)	-2.56	0.37	1936	<0.001
Physical health status	β_{01}	--	--	--	--	--	--	β_{01}	0.86	(0.679,1.153)	-0.12	0.13	1936	0.366
Gender	β_{02}	--	--	--	--	--	--	β_{02}	1.04	(0.815,1.339)	0.04	0.13	1936	0.730
SEG	β_{03}	--	--	--	--	---	---	β_{03}	0.93	(0.728,1.193)	-0.07	0.13	1936	0.575
Mental health status (MH)	β_{04}	--	--	--	--	--	--	β_{04}	1.13	(0.853,1.497)	0.12	0.14	1936	0.393
Age	β_{05}	--	--	--	--	--	--	β_{05}	1.18	(0.856,1.627)	0.17	0.16	1936	0.312
Living alone or not	β_{06}	--	--	--	--	---	---	β_{06}	0.87	(0.630,1.214)	-0.13	0.17	1936	0.422
Level 1 slope														
Info seeking – anxiety	β_{10}	1.21	(1.066,1.375)	0.19	0.07	1942	0.003	β_{10}	1.21	(1.066,1.375)	0.19	0.07	1936	0.003
Level 1 slope														
Wave – anxiety	β_{20}	0.96	(0.924,1.000)	-0.04	0.02	1942	0.049	β_{20}	0.96	(0.924,1.000)	-0.04	0.02	1936	0.049

Wellbeing															
Intercept	β_{00}	0.22	(0.199,0.248)	-1.51	0.06	1942	<0.001	β_{00}	0.27	(0.139,0.521)	-1.31	0.34	1936	<0.001
Physical health status	β_{01}	--	--	--	--	--	--	β_{01}	1.09	(0.858,1.392)	0.09	0.12	1936	0.470
Gender	β_{02}	--	--	--	--	--	--	β_{02}	1.11	(0.882,1.392)	0.10	0.12	1936	0.379
SEG	β_{03}	--	--	--	--	---	---	β_{03}	0.75	(0.600,0.945)	-0.28	0.12	1936	0.014
Mental health status (MH)	β_{04}	--	--	--	--	--	--	β_{04}	1.31	(1.009,1.691)	0.27	0.13	1936	0.042
Age	β_{05}	--	--	--	--	--	--	β_{05}	0.97	(0.723,1.304)	-0.03	0.15	1936	0.845
Living alone or not	β_{06}	--	--	--	--	---	---	β_{06}	1.07	(0.794,1.436)	0.07	0.15	1936	0.664
Level 1 slope															
Info seeking – wellbeing	β_{10}	1.12	(1.003,1.248)	0.11	0.06	1942	0.044	β_{10}	1.12	(1.003,1.248)	0.11	0.06	1936	0.044
Level 1 slope															
Wave – wellbeing	β_{20}	0.97	(0.940,1.005)	-0.03	0.02	1942	0.044	β_{20}	0.97	(0.940,1.005)	-0.03	0.02	1936	0.097
Loneliness															
Intercept	β_{00}	7.78	(6.909,8.763)	2.05	0.06	1942	<0.001	β_{00}	10.49	(5.113,21.525)	2.35	0.37	1936	<0.001
Physical health status	β_{01}	--	--	--	--	--	--	β_{01}	1.10	(0.843,1.427)	0.09	0.13	1936	0.490
Gender	β_{02}	--	--	--	--	--	--	β_{02}	0.93	(0.729,1.194)	-0.07	0.13	1936	0.580
SEG	β_{03}	--	--	--	--	---	---	β_{03}	1.01	(0.791,1.293)	0.02	0.13	1936	0.931
Mental health status (MH)	β_{04}	--	--	--	--	--	--	β_{04}	0.82	(0.624,1.090)	-0.19	0.14	1936	0.175
Age	β_{05}	--	--	--	--	--	--	β_{05}	0.88	(0.641,1.217)	-0.12	0.16	1936	0.447
Living alone or not	β_{06}	--	--	--	--	---	---	β_{06}	1.22	(0.879,1.689)	0.20	0.17	1936	0.235
Level 1 slope															
Info seeking – loneliness	β_{10}	0.93	(0.818,1.054)	-0.07	0.06	1942	0.251	β_{10}	0.93	(0.818,1.054)	-0.07	0.06	1936	0.251
Level 1 slope															
Wave – loneliness	β_{20}	1.05	(1.013,1.093)	0.05	0.02	1942	0.008	β_{20}	1.05	(1.013,1.093)		0.02	1936	0.008

Note: OR = odds ratios

Author contributions

S.W. and D.O'C. led the statistical analyses and led the drafting of the manuscript but all authors contributed to further drafting, revising and approved the final manuscript for submission.

Conflict of interest.

None of the authors have any conflict of interest to declare.