Pandemic Loneliness in Healthcare Workers. Does It Predict Later Psychological Distress?

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Abstract
Increased loneliness associated with the COVID-19 pandemic has been widely reported, with healthcare workers at increased risk compared to the general population. Pre-pandemic research indicates that loneliness has long-term detrimental effects on mental well-being, but the effect of loneliness in the context of COVID-19 is not clear. We conducted an online survey of healthcare workers (HCWs) at a large teaching hospital in Sydney, Australia after the peak of the first wave of the pandemic in 2020. Over one-third experienced loneliness at the peak of the first wave. An observed association with high psychological distress in subsequent months was attenuated after adjusting for status of mental well-being during the peak and before the pandemic. Mental well-being during the peak of the pandemic and, to a lesser extent, mental well-being before the pandemic were the strongest predictors of later distress. Increased conflict at home was also predictive of later distress. The mental health of HCWs is an important consideration at any time and is especially so in the face of crises such as the current global pandemic. Strategies to enhance baseline mental well-being and bolster well-being during crisis situations should assist HCWs cope with unexpected stressors and reduce the associated detrimental psychological consequences.

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**Introduction**

One of the indirect consequences of the COVID-19 global pandemic has been its impact on mental well-being. Elevated levels of mental health problems including depression, anxiety, stress and psychological distress have been reported along with increased loneliness (Bu et al., 2020; Gilbar et al., 2022; Gozansky et al., 2021; Khan & Kadoya, 2021; Killgore, Cloonan, Taylor, & Dailey, 2020; Krendl & Perry, 2021; Lee et al., 2020; McGinty et al., 2020; Pierce et al., 2020; van der Velden et al., 2021) although others have reported no significant changes or mixed results at best (Hyland et al., 2021; Latikka et al., 2022; Lee et al., 2020; Luchetti et al., 2020).

Research undertaken prior to the pandemic indicates that there is a positive relationship between loneliness and subsequent depression (Cacioppo et al., 2010; Lee et al., 2021; Loades et al., 2020; Wang et al., 2018) that can be long-term for older adults as well as youths. Among older adults, loneliness was a significant predictor of depressive symptoms 1 year later, independent of baseline symptoms, demographics and other covariates (Cacioppo et al., 2010). In a longer-term study, lonely older adults had more severe symptoms of depression 12 years later, although the magnitude of the association declined as follow-up progressed (Lee et al., 2021). A review of studies of children, adolescents and young adults reported that loneliness increased the risk of mental health problems, most notably depression, up to 9 years later (Loades et al., 2020).

Initial follow-up studies with short timeframes during the current pandemic have provided inconsistent results regarding the impact of loneliness on well-being. Psychological distress at 1-month follow-up was significantly predicted by baseline distress but not loneliness (Cooper et al., 2021). Conversely, in another study loneliness during lockdown predicted depression, but not anxiety or stress, 5 weeks later; however, depression at baseline was the strongest predictor of follow-up depression (Gozansky et al., 2021). Loneliness in the first week of Ireland’s initial lockdown predicted both depression and anxiety 6 weeks later, after controlling for baseline depression and anxiety respectively (Hyland et al., 2021). In the United Kingdom loneliness assessed during the early stages of the pandemic predicted depressive symptom scores 1 month later but not at 2 months follow-up (Groarke et al., 2021), suggesting that time may be influential in the relationship between loneliness and longer-term well-being. Overall, these studies reveal that the link between loneliness and depression appears to be of short duration and loneliness does not predict depression as strongly as baseline depression itself; findings regarding the association with anxiety are mixed. The paucity of research examining the relationship between loneliness and psychological distress indicates the need for further work in this area. It
has also been noted that short term coping strategies may obscure the pandemic’s impact, necessitating longer follow-up periods to detect delayed symptoms and more accurately measure the ongoing psychological impact of the pandemic (Chen & Bonanno, 2020; Groarke et al., 2021).

Inconsistent findings between existing studies may be a consequence of measures being taken at different points in time along resilience trajectories (Gilbar et al., 2022) requiring follow-up periods of at least a few months to assess the ongoing impact of pandemic-related loneliness more comprehensively. Psychological distress may stabilise over time as ongoing exposure to pandemic-related measures facilitates adaptation (Groarke et al., 2021; Mann & Walker, 2022). The declines in mental well-being experienced by healthcare workers (HCWs) early in the pandemic improved after several months, but did not return to pre-pandemic levels (Stubbs et al., 2021). After increasing between April and May 2020, loneliness plateaued from May to June 2020 (Killgore et al., 2020b). Similarly, initial increases in psychological distress and other mental health symptoms declined over a period of months as the pandemic progressed (Fancourt et al., 2021; Robinson et al., 2022; Stubbs et al., 2021) suggesting that, even during a global pandemic, the majority of people are resilient (Chen & Bonanno, 2020). The highly dynamic nature of the pandemic and sporadic changes in government restrictions in response to case numbers might affect not only well-being at any particular point in time, but also the relationships among risk factors of mental well-being (Bendau et al., 2021; Gilbar et al., 2022; Groarke et al., 2021).

As key actors in the response to the pandemic, HCWs have been encumbered by burdens beyond those experienced by most of the general public, heightening their potential for adverse psychological effects (Conversano et al., 2020; Pfefferbaum & North, 2020). HCWs are at higher risk of contracting COVID-19 and have the added concern of putting their family at increased risk of infection (Achat et al., 2022; Pfefferbaum & North, 2020). Some have been shunned by family and friends or experienced abuse from members of the public while others have lived away from their family to avoid infecting them (Achat et al., 2022; Johnson, 2021). Shortages of personal protective equipment in the earlier phases of the pandemic, longer working hours, redeployment to unfamiliar work areas, changing protocols, re-organisation of services, moral injury arising from feelings of betrayal or acts of omission or commission that conflict with one’s moral or ethical code further contribute to HCWs’ distress (Conversano et al., 2020; Kinman et al., 2020; Pfefferbaum & North, 2020). Reported high levels of loneliness and mental health problems (Cabello et al., 2021; De Sio et al., 2020, 2021; Gilleen et al., 2021; Lai et al., 2020; Repon et al., 2021; Stubbs et al., 2021)—higher than the general population (Kotera et al., 2021)—are consistent with findings from the SARS outbreak that HCWs were more likely than non-HCWs to report feeling lonely and other adverse psychological effects (Lee et al., 2007; Reynolds et al., 2008). Adverse outcomes might persist for more than a year (Maunder et al., 2006) accentuating the need to investigate and take preventative action. Minimising the psychological impact of the COVID-19 pandemic on HCWs not only protects their
wellbeing but also helps to ensure a healthy workforce, an essential component in our ongoing response to the pandemic (The Lancet, 2020).

To date, most research has examined the more immediate effects of loneliness during the COVID-19 pandemic on mental well-being. We aimed to investigate the effect of loneliness experienced during the peak of the first wave of the pandemic on HCW’s psychological distress several months later when the initial wave had passed and many restrictions had been or were being eased. Based on evidence from the SARS outbreak, we hypothesised that HCWs who were lonely during the pandemic would be more likely to report high psychological distress several months later. We also hypothesised that other measures of poor mental well-being would be associated with subsequent psychological distress.

Material and Methods

Study Design and Setting

A retrospective cross-sectional survey was undertaken at a designated isolation facility in Sydney, New South Wales (NSW), where some of the first COVID-19 patients in Australia were admitted. Facilities at this large tertiary teaching hospital included a COVID-19 testing clinic and dedicated COVID-19 wards, including a COVID-19 ward within the intensive care unit.

Participants

Participants were Staff working at the hospital during the peak of the first wave of the COVID-19 pandemic in 2020. Of the 403 eligible HCWs who participated in the survey, 325 (80.6%) answered the questions about loneliness and later psychological distress and formed the sample for this study. Most commonly, participants were female (71.7%), aged 50 years or older (28.4%), nurses (38.4%), working in the Intensive Care Unit (ICU; 19.8%), in a patient facing role (77.0%), and had worked in their professional role for a mean of 12.4 years (range 0–42 years) (Table 1).

Procedure

Staff working in departments caring for patients with suspected or confirmed COVID-19 and those whose primary responsibility was to address the organisation’s response to COVID-19 were individually invited to participate. Staff were emailed a link to the study information and consent form and online questionnaire. A reminder was sent 3 weeks later. Hard copy questionnaires and study posters including a QR code and weblink to the online questionnaire were also distributed. Researchers visited the Emergency Department, ICU and COVID clinic to speak to staff about the study and distribute study flyers containing the QR code and weblink, and the General Services Department to facilitate questionnaire completion by cleaning staff who may have
Table 1. Factors Associated With Experiencing High Psychological Distress After the Peak of the First Wave of the COVID-19 Pandemic.

| Variables                        | All \((n = 325)\) | High psychological distress – post peak \((n = 75)\) |
|----------------------------------|-------------------|--------------------------------------------------|
|                                  | \(n\) (% )        | \(n\) (% ) | Rate per 100 | \(\chi^2\) | \(p\) | OR (95%CI) |
| **Sex**                          |                   |                   |              |            |     |            |
| Female                           | 223 (71.7)        | 58 (82)          | 26.0         | 4.52       | 0.03 | ref        |
| Male                             | 88 (28.3)         | 13 (18)          | 14.8         | 0.49       |      | (0.26–0.96) |
| **Age (years)**                  |                   |                   |              |            |     |            |
| 18–29                            | 80 (25.8)         | 22 (31)          | 27.5         | 0.80       | 0.43 | 1.29       |
| 30–39                            | 73 (23.6)         | 16 (23)          | 21.9         | 0.95       |      | (0.45–2.01) |
| 40–49                            | 69 (22.3)         | 13 (18)          | 18.8         | 0.79       |      | (0.36–1.73) |
| 50+                              | 88 (28.4)         | 20 (28)          | 22.7         | ref        |      |            |
| **Living arrangement**           |                   |                   |              |            |     |            |
| Partner +/- children or any other family | 196 (62.8) | 42 (60)          | 21.4         | 0.55       | 0.91 | ref        |
| Family excluding a partner       | 64 (20.5)         | 16 (23)          | 25.0         | 1.22       |      | (0.63–2.37) |
| Non-family                       | 20 (6.4)          | 4 (6)            | 20.0         | 0.92       |      | (0.29–2.89) |
| Alone                            | 32 (10.3)         | 8 (11)           | 25.0         | 1.22       |      | (0.51–2.92) |
| **Psychological distress (K10) – during peak** |                   |                   |              |            |     |            |
| Low                              | 211 (64.9)        | 12 (16)          | 5.7          | 102.47     | <.0001 | ref        |
| High                             | 114 (35.1)        | 63 (84)          | 55.3         | 20.49      |      | (10.28–40.83) |
| **Mental health – pre-pandemic** |                   |                   |              |            |     |            |
| Good                             | 289 (89.2)        | 55 (73)          | 19.0         | 25.49      | <.0001 | ref        |
| Poor                             | 35 (10.8)         | 20 (27)          | 57.1         | 5.67       |      | (2.73–11.78) |
| **Mental health – during peak**  |                   |                   |              |            |     |            |
| Good                             | 177 (55.0)        | 20 (27)          | 11.3         | 30.31      | <.0001 | ref        |
| Poor                             | 145 (45.0)        | 54 (73)          | 37.2         | 4.66       |      | (2.62–8.27) |

(continued)
Table 1. (continued)

| Variables                                      | All \((n = 325^*)\) | High psychological distress – post peak \((n = 75^*)\) |
|------------------------------------------------|----------------------|-------------------------------------------------------|
|                                                | \(n\) (%)           | \(n\) (%) 100 \(\chi^2\)    | \(p\)   | OR (95%CI) |
| **Mental health – post peak**                  |                      |                                        |        |            |
| Good                                           | 266 (81.8) 41 (55) 15.4 48.48 <.0001 ref    |                                        |        |            |
| Poor                                           | 59 (18.2) 34 (45) 57.6 7.46 \(4.04–13.80\) |                                        |        |            |
| **Ever told had mental health problems**       |                      |                                        |        |            |
| No                                             | 229 (76.1) 33 (52) 14.4 26.85 <.0001 ref    |                                        |        |            |
| Yes                                            | 72 (23.9) 31 (48) 43.1 4.49 \(2.48–8.14\) |                                        |        |            |
| **General health – pre-pandemic**              |                      |                                        |        |            |
| Good                                           | 301 (92.9) 69 (92) 22.9 0.12 0.73 ref    |                                        |        |            |
| Poor                                           | 23 (7.1) 6 (8) 26.1 1.19 \(0.45–3.13\) |                                        |        |            |
| **General health – during peak**               |                      |                                        |        |            |
| Good                                           | 262 (81.6) 54 (72) 20.6 6.04 0.01 ref    |                                        |        |            |
| Poor                                           | 59 (18.4) 21 (28) 35.6 2.13 \(1.16–3.92\) |                                        |        |            |
| **General health – post peak**                 |                      |                                        |        |            |
| Good                                           | 295 (90.8) 65 (87) 22.0 1.96 0.16 ref    |                                        |        |            |
| Poor                                           | 30 (9.2) 10 (13) 33.3 1.77 \(0.79–3.97\) |                                        |        |            |
| **At increased risk due to illness/condition**|                      |                                        |        |            |
| No                                             | 268 (82.5) 54 (72) 20.2 7.38 0.01 ref    |                                        |        |            |
| Yes                                            | 57 (17.5) 21 (28) 36.8 2.31 \(1.25–4.28\) |                                        |        |            |
| **Sleep problems**                              |                      |                                        |        |            |
| No                                             | 186 (57.2) 24 (32) 12.9 25.36 <.0001 ref    |                                        |        |            |
| Yes                                            | 139 (42.8) 51 (68) 36.7 3.91 \(2.26–6.78\) |                                        |        |            |
| **Traumatic life event experienced during peak**|                      |                                        |        |            |
| No                                             | 263 (80.9) 51 (68) 19.4 10.55 0.001 ref    |                                        |        |            |
| Yes                                            | 62 (19.1) 24 (32) 38.7 2.63 \(1.45–4.76\) |                                        |        |            |
| **Patient facing role**                        |                      |                                        |        |            |
| No                                             | 73 (23.0) 14 (19) 19.2 0.76 0.38 ref    |                                        |        |            |
| Yes                                            | 245 (77.0) 59 (81) 24.1 1.34 \(0.70–2.57\) |                                        |        |            |

(continued)
### Table 1. (continued)

| Variables                                                                 | All (n = 325*) | High psychological distress – post peak (n = 75*) | Rate per 100 | $\chi^2$ | p     | OR (95%CI) |
|---------------------------------------------------------------------------|----------------|--------------------------------------------------|--------------|----------|-------|-----------|
| Work in high exposure area†                                               |                |                                                  |              |          |       |           |
| No                                                                        | 191 (60.3)     | 48 (67)                                          | 25.1         | 1.60     | 0.21  | ref       |
| Yes                                                                       | 126 (39.8)     | 24 (33)                                          | 19.1         |          | 0.70  | (0.40–1.22) |
| Work role                                                                 |                |                                                  |              |          |       |           |
| Doctor                                                                    | 57 (17.9)      | 8 (11)                                           | 14.0         | 6.67     | 0.04  | ref       |
| Nurse/Oral health                                                          | 139 (43.7)     | 41 (56)                                          | 29.5         |          | 2.56  | (1.12–5.89) |
| Other                                                                     | 122 (38.4)     | 24 (33)                                          | 19.7         |          | 1.50  | (0.63–3.58) |
| Years of professional experience                                          |                |                                                  |              |          |       |           |
| <5                                                                        | 80 (27.8)      | 15 (23)                                          | 18.8         | 0.94     | 0.35  | 0.72 (0.37–1.41) |
| 5–9                                                                       | 56 (19.4)      | 13 (20)                                          | 23.2         |          | 0.94  | (0.46–1.94) |
| 10 or more                                                                | 152 (52.8)     | 37 (57)                                          | 24.3         |          | ref   |           |
| Felt a sense of camaraderie with fellow workers                           |                |                                                  |              |          |       |           |
| No                                                                        | 70 (22.0)      | 13 (18)                                          | 18.6         | 0.98     | 0.32  | ref       |
| Yes                                                                       | 248 (78.0)     | 60 (82)                                          | 24.2         |          | 1.40  | (0.72–2.73) |
| Aware of increased conflict between fellow workers                        |                |                                                  |              |          |       |           |
| No                                                                        | 210 (66.3)     | 42 (58)                                          | 20.0         | 3.22     | 0.07  | ref       |
| Yes                                                                       | 107 (33.8)     | 31 (42)                                          | 29.0         |          | 1.63  | (0.95–2.79) |
| During height of pandemic, well-being was negatively affected by:         |                |                                                  |              |          |       |           |
| Decreased household income                                                |                |                                                  |              |          |       |           |
| No                                                                        | 264 (81.5)     | 55 (73)                                          | 20.8         | 4.29     | 0.04  | ref       |
| Yes                                                                       | 60 (18.5)      | 20 (27)                                          | 33.3         |          | 1.90  | (1.03–3.51) |
| Changed access to children or other dependents                            |                |                                                  |              |          |       |           |
| No                                                                        | 264 (81.7)     | 61 (81)                                          | 23.1         | 0.01     | 0.92  | ref       |
| Yes                                                                       | 59 (18.3)      | 14 (19)                                          | 23.7         |          | 1.04  | (0.53–2.01) |
| Changed living arrangements                                               |                |                                                  |              |          |       |           |
| No                                                                        | 291 (89.5)     | 67 (89)                                          | 23.0         | 0.00     | 0.95  | ref       |
| Yes                                                                       | 34 (10.5)      | 8 (11)                                           | 23.5         |          | 1.03  | (0.45–2.38) |

(continued)
otherwise found it difficult to participate due to English literacy and computer access issues. Complementing the targeted recruitment, a general invitation to participate was extended all hospital staff via the placement of promotional posters in lift areas, setting-up a promotional table in common areas and distributing flyers to staff, and promotional articles published on various staff information channels.

The questionnaire was available from 3 November 2020 to 31 January 2021 and took approximately 15 min to complete. Contact details for various mental and well-being support services were provided at the end of the questionnaire.

### Survey Instrument

The questionnaire assessed basic demographic details (age, sex, usual living arrangements, highest educational qualification); indicators of health and well-being; health-related behaviours (physical activity, smoking, alcohol consumption and sleeping patterns); the impact of family/household and social circumstances on personal well-being; and workplace experiences. Workplace experiences are not the focus of this paper and have been reported elsewhere (Trinh et al., 2022). Consent to participate was required before commencing the study questions.
Self-rated general health (SRH) and mental health (SRMH) were reported for three periods: before the pandemic, during the peak of the first wave of the pandemic and currently (assessed six or more months after the peak) and rated as excellent, very good, good, fair, poor, or very poor. SRH has been described as a “powerful construct” (McAlpine et al., 2018); it is generally accepted to be a reliable and valid measure of health status and is commonly used in surveys to measure general health (DeSalvo et al., 2006; McAlpine et al., 2018). Assessment of SRMH indicates it may be useful for monitoring non-specific mental health (Ahmad et al., 2014; Mawani & Gilmour, 2010).

The 10 item Kessler Psychological Distress Scale (K10) (Kessler et al., 2002) assessed current psychological distress and retrospectively assessed distress during the peak of the pandemic. The high internal consistency of the K10 has been reported in population surveys (Cronbach’s alpha 0.93) (Kessler et al., 2002) and more recently during the COVID-19 pandemic in Australia (Cronbach’s alpha 0.92) (Rahman et al., 2021). It has satisfactory item-total correlations (0.57–0.78) (Rahman et al., 2021) and good ability to discriminate between community Diagnostic and Statistical Manual-IV cases and non-cases (area under the receiver operator characteristics curve = 0.876) (Kessler et al., 2002).

The questionnaire included a timeline plotting the daily number of new COVID-19 cases in NSW from December 2019 (pre-pandemic) until the start of the study to orientate participants to each of the time periods assessed. Data quality relating to potential bias in recalling past well-being can be improved by anchoring memories before assessment (Kessler, personal communication).

The existence and impact of potential family/household and social stressors (e.g. feelings of loneliness, decreased household income, less contact with family and friends you do not live with) during the peak of the pandemic were assessed. Participants retrospectively indicated whether they encountered any of the experiences, and if so, whether it had affected their well-being. Self-reported measures of loneliness ask directly about feelings of loneliness and in general are easy to use and acceptable to respondents (Victor et al., 2005). For analysis, ‘experienced but not affected’ responses were combined with ‘not experienced’ and compared with ‘experienced and affected’ as mental health is influenced by the subjective perception rather than objective experience of COVID-19 (Cabello et al., 2021).

Data Analysis

Participants were classified as lonely if they reported having feelings of loneliness that negatively affected their well-being during the peak of the pandemic. Participants not experiencing loneliness or not affected by it were classified as not lonely. Responses to the other family/household and social questions were similarly classified. General health and mental health were categorised as good (good, very good or excellent responses) or poor (fair, poor or very poor responses). Total K10 score was calculated by summing the score on individual items. If there were only nine valid scores, the missing score was imputed using the mean of the valid scores; less than nine valid
responses resulted in a missing total score (Centre for Epidemiology and Evidence, 2020). High psychological distress was indicated by a total K10 score of 22 or more; scores of 10–21 indicated low distress (Australian Bureau of Statistics, 2012; Centre for Epidemiology and Evidence, 2020).

Associations between psychological distress several months after the peak of the first wave of the pandemic and loneliness and personal and work-related factors were examined using Chi squared. Factors significantly related to later distress in univariate logistic regressions were entered one at a time into the multivariate model. Loneliness, age, sex and factors with \( p < 0.05 \) were retained in the final model. Participants with a missing value for any of the variables in a regression model were excluded. Data analysis was performed using SAS EG v8.3. The study was approved by the hospital’s Human Research Ethics Committee (2020/ETH01674).

**Results**

Comparison of the 325 HCWs who answered the questions about loneliness and later psychological distress with those who did not revealed no differences in terms of sex \( (p = 1.0) \), age group \( (p = 0.73) \), work role \( (p = 0.34) \), years of experience \( (p = 0.33) \), or self-rated mental health either before the pandemic \( (p = 0.85) \) or after its first peak \( (p = 0.37) \).

Almost one-quarter (23.9%) of HCWs had ever been told by a doctor or other health professional they had mental health problems. Approximately two in every five (126; 38.8%) HCWs reported that loneliness had negatively affected their well-being during the peak of the first wave of the pandemic (‘lonely’); the remainder either did not experience loneliness (37.5%) or were not affected by it (23.7%) (both classified as ‘non-lonely’). Psychological distress in HCWs was significantly more common during the peak (35.1%) than several months later (23.1%; \( \chi^2 = 102.5, p < 0.0001 \)).

HCWs who were lonely during the peak of the first wave of the pandemic were more likely than non-lonely colleagues to report high psychological distress when assessed six or more months later (36.5% vs. 14.6%, \( \chi^2 = 20.9, p < 0.0001 \)) (Table 1). Other factors associated with later high psychological distress included being female; psychological distress during the peak; mental health prior to the pandemic, and during and after its peak; having ever been told they had a mental health problem/s; poor general health during the peak of the pandemic; having an illness/condition that put them at increased risk during the pandemic; experiencing sleep problems or a traumatic life event during the peak of the pandemic; well-being negatively affected by decreased household income, increased conflict at home, or less contact with family or friends; work role.

After adjusting for the other variables in the model, loneliness did not predict later psychological distress (aOR 0.72, 95% CI: 0.32–1.06) (Table 2). Psychological distress during the peak of the first wave (aOR 24.00, 95% CI: 10.23–56.28) and to a lesser extent, self-reported mental health status prior to the pandemic (aOR 5.32, 95% CI: 2.03–13.97) were the strongest predictors of later distress. Increased conflict at home
also predicted later distress (aOR 2.85, 95% CI: 1.20–6.74). Correlation between variables in the final model did not reach 0.6, and in most cases was much lower, variance inflation factors were all below 2.

**Table 2.** Loneliness During the Peak of the First Wave of the COVID-19 Pandemic as a Predictor of Post-Peak Psychological Distress, Adjusting for Potential Confounders.*

| Variables | Wald $\chi^2$ | $p$  | aOR* (95% CI)          |
|-----------|---------------|------|------------------------|
| Sex       |               |      |                        |
| Female    |               |      | ref        |
| Male      | 2.97          | 0.09 | 0.47 (0.20–1.11)        |
| Age (years) |             |      |            |
| 18–29     | 1.65          | 0.20 | 0.54 (0.21–1.39)        |
| 30–39     | 1.30          | 0.25 | 0.56 (0.20–1.52)        |
| 40–49     | 0.95          | 0.33 | 0.60 (0.21–1.68)        |
| 50+       |               |      | ref        |
| Psychological distress – during peak |       |      |            |
| Low       |               |      | ref        |
| High      | 53.39         | <0.0001 | 24.00 (10.23–56.28) |
| Mental health – pre-pandemic |       |      |            |
| Good      |               |      | ref        |
| Poor      | 11.53         | 0.0007 | 5.32 (2.03–13.97) |
| During peak, well-being was negatively affected by: |       |      |            |
| Increased conflict at home |       |      |            |
| No        |               |      | ref        |
| Yes       | 5.67          | 0.02 | 2.85 (1.20–6.74)        |
| Feelings of loneliness |       |      |            |
| No        |               |      | ref        |
| Yes       | 0.66          | 0.42 | 0.72 (0.32–1.60)        |

*Odds ratios were adjusted for all other variables in the model as specified in the table. aOR: adjusted odds ratio; CI: confidence interval.

Discussion

HCWs affected by loneliness during the peak of the first wave of the pandemic were at increased risk of psychological distress several months later, but their subsequent psychological distress was most strongly predicted by mental well-being during the peak of the pandemic and prior to its onset.

Our findings indicating that loneliness is a predictor of psychological distress and other mental health problems are consistent with most of the pre-pandemic studies, although in our study it was not the strongest influencing factor. The unique circumstances of the pandemic—government mandated restrictions on movement, limited social interactions, fear of contamination—may have engendered a loneliness peculiar
to this situation (Cooper et al., 2021; Loades et al., 2020; Stubbs & Achat, 2022), affecting people who normally would be unlikely to be lonely (Khan & Kadoya, 2021), and for some lessening the usual detrimental impact of loneliness on well-being (Loades et al., 2020). As we did not measure loneliness at follow-up, we do not know if loneliness levels subsided over time. Psychological distress and self-rated mental health improved in this sample over the same period (Stubbs et al., 2021) suggesting that loneliness may have done likewise. Compared to loneliness experienced at other times, for many people loneliness during the pandemic may be a temporary response to a unique situation, limiting its usual longer-term effect on mental well-being.

Pre-pandemic mental health is associated with mental well-being during the pandemic among both HCWs and non-HCWs. This association has been reported at various stages during the first wave of the pandemic—including during its peak, shortly after the peak, and a couple of months later (Benke et al., 2020; Breslau et al., 2021; Gilleen et al., 2021; Rahman et al., 2020; Stubbs et al., 2021; Young et al., 2021). Our study has the benefit of having mental well-being assessments for three time periods—pre-pandemic, during the peak of the first wave, and several months later. Multivariate analysis revealed that the strongest predictor of later psychological distress was psychological distress at the peak, not pre-pandemic mental health—important information for efforts to safeguard against the adverse psychological impact of the pandemic. Failure to provide appropriate interventions and support to HCWs most psychologically affected will deny the duty of care owed to them and will also influence the healthcare system’s ability to operate safely and effectively (Young et al., 2021).

The curtailing of social interactions and movement, while simultaneously facing a highly stressful event, has enormous potential for conflict in the home which in turn can further exacerbate the adverse psychological impact of stressful events (Behar-Zusman et al., 2020). Studies conducted during the COVID-19 pandemic support this detrimental interplay of factors, reporting that conflict in the home was strongly associated with both depression and anxiety (Tyler et al., 2021). In a longitudinal study, adolescents who reported increased conflict with their father during the COVID-19 pandemic had increased symptoms of depression at follow-up (Magson et al., 2021). Our study of HCWs found that increased conflict at home during the first peak predicted psychological distress at follow-up; conflict in the workplace was not a risk factor for distress in either univariate or multivariate analyses. Other measures of social contact and relationships, specifically changes in living arrangements and in access to children or other dependents, less contact with family and friends, and a sense of camaraderie with workmates either did not predict distress or were no longer significant after adjusting for covariates.

Successive waves of the pandemic and the emergence of new variants, with the potential for the re-imposition of restrictions, provide ongoing prospects for psychological consequences (Busch et al., 2021; Killgore, Cloonan, Taylor, Miller, & Dailey, 2020). Understanding the psychological impact of COVID-19 is important during the current pandemic and to inform mental health safeguards for future pandemics (Groarke et al., 2021). Strategies to bolster mental well-being in the face of
situations such as the COVID-19 pandemic could start by improving mental health during non-crisis times (Busch et al., 2021). A proactive approach that enhances baseline health and well-being and which provides psychological support and assistance to HCWs throughout highly stressful situations, would enhance their ability to deal with the stressors of pandemics and other crisis situations (Busch et al., 2021; Cooper et al., 2021). Our results indicate that addressing issues such as family conflict and loneliness would also be beneficial.

The primary limitation of our study is that baseline measures were retrospective and may therefore be subject to recall error. Evidence of the accuracy of retrospective recall of previous psychological well-being is inconclusive and may depend on a range of factors. Although university students retrospectively recalled higher distress scores than originally recorded (6 months–3¾ years earlier), their level of distress classification did not change (Brennan et al., 2006). However, the sub-group of students significantly distressed at baseline did not retrospectively record significantly higher scores or changes in distress classification (Brennan et al., 2006). HCWs’ well-being at the time of questionnaire completion may have biased responses as current or recent depression has been shown to improve recall of depressive episodes (Simon & VonKorff, 1995). Consistent with the findings of Brennan et al., other research also indicates that retrospective surveys undercount the prevalence of past mental health conditions, although symptom severity and treatment increase recall accuracy (Moffitt et al., 2010; Simon & VonKorff, 1995).

Our study is one of a few to date that report on follow-up of the original cohort of HCWs, providing data about well-being at the peak of the first wave of the pandemic and several months later when many restrictions were being eased. We were able to go beyond measures of association to determine predictors of psychological distress. Similar to previous studies, loneliness was assessed using a single question, asking participants if feelings of loneliness had affected their well-being (Latikka et al., 2022; Victor & Yang, 2012). This direct phenomenological approach, as opposed to an indirect multi-question scale, allows respondents to self-define loneliness (Nicolaisen & Thorsen, 2014)—an appropriate methodology for our study which required respondents to evaluate the impact of loneliness on their well-being. Recruitment strategies for our study initially focused on departments most involved in the pandemic response before being extended more broadly. The inability to calculate a response rate was compensated for by an increase in our sample size with the participation of a wider range of staff.

**Conclusion**

Loneliness in HCWs is a legitimate concern with over one-third reporting that it negatively impacted their well-being during the peak of the first wave of the COVID-19 pandemic in 2020. Pandemic loneliness was associated with later psychological distress, but this was negated by mental well-being, especially psychological distress at the peak of the first wave of the pandemic. Bolstering HCWs’ mental well-being as they
respond to outbreaks of highly infectious diseases such as COVID-19 is beneficial for their immediate and future well-being and will concomitantly benefit the healthcare system and those being cared for.

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**References**

Achat, H. M., Mittal, R., Stubbs, J. M., Gilroy, N., Schindeler, S. K., Shaban, R. Z., & Solano, T. (2022). Managing COVID-19 in an Australian designated isolation facility: Implications for current and future healthcare crises. medRxiv. https://doi.org/10.1101/2022.05.05.22274702

Ahmad, F., Jhajj, A. K., Stewart, D. E., Burghardt, M., & Bierman, A. S. (2014). Single item measures of self-rated mental health: A scoping review. BMC Health Services Research, 14, Article 398. https://doi.org/10.1186/1472-6963-14-398

Australian Bureau of Statistics. (2012). 4817.0.55.001 - Information Paper: Use of the Kessler psychological distress Scale in ABS health surveys, Australia, 2007-08. https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4817.0.55.001Main+Features12007-08?OpenDocument

Behar-Zusman, V., Chavez, J. V., & Gattamorta, K. (2020). Developing a measure of the impact of COVID-19 social distancing on household conflict and cohesion. Family Process, 59(3), 1045–1059. https://doi.org/10.1111/famp.12579

Bendau, A., Plag, J., Kunas, S., Wyka, S., Ströhle, A., & Petzold, M. B. (2021). Longitudinal changes in anxiety and psychological distress, and associated risk and protective factors during the first three months of the COVID-19 pandemic in Germany. Brain and Behavior, 11(2), Article e01964. https://doi.org/10.1002/brb3.1964
Benke, C., Autenrieth, L. K., Asselmann, E., & Pané-Farré, C. A. (2020). Lockdown, quarantine measures, and social distancing: Associations with depression, anxiety and distress at the beginning of the COVID-19 pandemic among adults from Germany. Psychiatry Research, 293, Article 113462. https://doi.org/10.1016/j.psychres.2020.113462

Brennan, A. M., Stewart, H. A., Jamhour, N., Businelle, M. S., & Gouvier, W. D. (2006). An examination of the retrospective recall of psychological distress. Journal of Forensic Neuropsychology, 4(4), 99–110. https://doi.org/10.1300/J151v04n04_06

Breslau, J., Roth, E. A., Baird, M. D., Carman, K. G., & Collins, R. L. (2021). A longitudinal study of predictors of serious psychological distress during COVID-19 pandemic. Psychological Medicine, 2021, 1–9. https://doi.org/10.1017/S0033291721004293

Bu, F., Steptoe, A., & Fancourt, D. (2020). Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic. Public Health, 186, 31–34. https://doi.org/10.1016/j.puhe.2020.06.036

Busch, I. M., Moretti, F., Mazzi, M., Wu, A. W., & Rimondini, M. (2021). What we have learned from two decades of epidemics and pandemics: A systematic review and meta-analysis of the psychological burden of frontline healthcare workers. Psychotherapy and Psychosomatics, 90(3), 178–190. https://doi.org/10.1159/000513733

Cabello, M., Izquierdo, A., & Leal, I. (2021). Loneliness and not living alone is what impacted on the healthcare professional’s mental health during the COVID-19 outbreak in Spain. Health and Social Care in the Community, 30, 968–975. https://doi.org/10.1111/hsc.13260

Cacioppo, J. T., Hawkley, L. C., & Thisted, R. A. (2010). Perceived social isolation makes me sad: 5-year cross-lagged analyses of loneliness and depressive symptomatology in the Chicago health, aging, and social relations study. Psychology and Aging, 25(2), 453–463. https://doi.org/10.1037/a0017216

Centre for Epidemiology and Evidence. (2020). Health statistics New South Wales. NSW Ministry of Health.

Chen, S., & Bonanno, G. A. (2020). Psychological adjustment during the global outbreak of COVID-19: A resilience perspective. Psychological Trauma: Theory, Research, Practice, and Policy, 12(S1), S51–S54. https://doi.org/10.1037/tra0000685

Conversano, C., Marchi, L., & Miniati, M. (2020). Psychological distress among healthcare professionals involved in the COVID-19 emergency: Vulnerability and resilience factors. Clinical Neuropsychiatry, 17(2), 94–96. https://doi.org/10.36131/CN20200212

Cooper, K., Hards, E., Moltrecht, B., Reynolds, S., Shum, A., McElroy, E., & Loades, M. (2021). Loneliness, social relationships, and mental health in adolescents during the COVID-19 pandemic. Journal of Affective Disorders, 289, 98–104. https://doi.org/10.1016/j.jad.2021.04.016

DeSalvo, K. B., Fisher, W. P., Tran, K., Bloser, N., Merrill, W., & Peabody, J. (2006). Assessing measurement properties of two single-item general health measures. Quality of Life Research: an International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation, 15(2), 191–201. http://www.jstor.org/record/journals/qualityoflife2006

De Sio, S., Buomprisco, G., La Torre, G., Lapteva, E., Perri, R., Greco, E., & Cedrone, F. (2020). The impact of COVID-19 on doctors’ well-being: Results of a web survey during the
lockdown in Italy. *European Review for Medical and Pharmacological Sciences*, 24(14), 7869–7879. https://doi.org/10.26355/eurrev_202007_22292

De Sio, S., La Torre, G., Buomprisco, G., Lapteva, E., Perri, R., Corbosiero, P., & Cedrone, F. (2021). Consequences of COVID19-pandemic lockdown on Italian occupational physicians’ psychosocial health. *Plos One*, 16(2), Article e0243194. https://doi.org/10.1371/journal.pone.0243194

Fancourt, D., Steptoe, A., & Bu, F. (2021). Trajectories of anxiety and depressive symptoms during enforced isolation due to COVID-19 in England: A longitudinal observational study. *Lancet Psychiatry*, 8(2), 141–149. https://doi.org/10.1016/s2215-0366(20)30482-x

Gilbar, O., Gelkopf, M., Berger, R., & Greene, T. (2022). Risk factors for depression and anxiety during COVID-19 in Israel: A two-wave study before and during the pandemic. *Stress and Health*. https://doi.org/10.1002/smi.3127

Gillean, J., Santaolalla, A., Valdearenas, L., Salice, C., & Fusté, M. (2021). Impact of the COVID-19 pandemic on the mental health and well-being of UK healthcare workers. *BJPsych Open*, 7(3), Article e88. https://doi.org/10.1192/bjo.2021.42

Gozansky, E., Moscona, G., & Okon-Singer, H. (2021). Identifying variables that predict depression following the general lockdown during the COVID-19 pandemic. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.680768

Groarke, J. M., McGlinchey, E., McKenna-Plumley, P. E., Berry, E., Graham-Wisener, L., & Armour, C. (2021). Examining temporal interactions between loneliness and depressive symptoms and the mediating role of emotion regulation difficulties among UK residents during the COVID-19 lockdown: Longitudinal results from the COVID-19 psychological wellbeing study. *Journal of Affective Disorders*, 285, 1–9. https://doi.org/10.1016/j.jad.2021.02.033

Hyland, P., Shevlin, M., Murphy, J., McBride, O., Fox, R., Bondjers, K., & Vallières, F. (2021). A longitudinal assessment of depression and anxiety in the Republic of Ireland before and during the COVID-19 pandemic. *Psychiatry Research*, 300, Article 113905. https://doi.org/10.1016/j.psychres.2021.113905

Johnson, S. (2021). *Spat at, abused, attacked: Healthcare staff face rising violence during Covid*. The Guardian. https://www.theguardian.com/global-development/2021/jun/07/spat-at-abused-attacked-healthcare-staff-face-rising-violence-during-covid

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32(6), 959–976. https://doi.org/10.1017/s0033291702006074

Khan, M. S. R., & Kadoya, Y. (2021). Loneliness during the COVID-19 pandemic: A comparison between older and younger people. *International Journal of Environmental Research and Public Health*, 18(15), Article 7871. https://doi.org/10.3390/ijerph18157871

Killgore, W. D. S., Cloonan, S. A., Taylor, E. C., & Dailey, N. S. (2020). Loneliness: A signature mental health concern in the era of COVID-19. *Psychiatry Research*, 290, Article 113117. https://doi.org/10.1016/j.psychres.2020.113117
Killgore, W. D. S., Cloonan, S. A., Taylor, E. C., Miller, M. A., & Dailey, N. S. (2020). Three months of loneliness during the COVID-19 lockdown. *Psychiatry Research, 293*, Article 113392. https://doi.org/10.1016/j.psychres.2020.113392

Kinnman, G., Teoh, K., & Harriss, A. (2020). Supporting the well-being of healthcare workers during and after COVID-19. *Occupational Medicine, 70*(5), 294–296. https://doi.org/10.1093/occmed/kqaa096

Kotera, Y., Ozaki, A., Miyatake, H., Tsunetoshi, C., Nishikawa, Y., & Tanimoto, T. (2021). Mental health of medical workers in Japan during COVID-19: Relationships with loneliness, hope and self-compassion. *Current Psychology, 1*–*4*. https://doi.org/10.1007/s12144-021-01514-z

Krendl, A. C., & Perry, B. L. (2021). The impact of sheltering in place during the COVID-19 pandemic on older adults’ social and mental well-being. *Journal Gerontology B Psychology Science Social Science, 76*(2), e53–e58. https://doi.org/10.1093/geronb/gbaa110

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., & Hu, S. (2020). Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Network Open, 3*(3), Article e203976. https://doi.org/10.1001/jamanetworkopen.2020.3976

Latikka, R., Koivula, A., Oksa, R., Savela, N., & Oksanen, A. (2022). Loneliness and psychological distress before and during the COVID-19 pandemic: Relationships with social media identity bubbles. *Social Science & Medicine, 293*, Article 114674. https://doi.org/10.1016/j.socscimed.2021.114674

Lee, A. M., Wong, J. G., McAlonan, G. M., Cheung, V., Cheung, C., Sham, P. C., & Chua, S. E. (2007). Stress and psychological distress among SARS survivors 1 year after the outbreak. *Canadian Journal of Psychiatry, 52*(4), 233–240. https://doi.org/10.1177/070674370705200405

Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health, 67*(5), 714–717. https://doi.org/10.1016/j.jadohealth.2020.08.009

Lee, S. L., Pearce, E., Ajnakina, O., Johnson, S., Lewis, G., Mann, F., & Lewis, G. (2021). The association between loneliness and depressive symptoms among adults aged 50 years and older: A 12-year population-based cohort study. *Lancet Psychiatry, 8*(1), 48–57. https://doi.org/10.1016/s2215-0366(20)30383-7

Lodes, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., & Crawley, E. (2020). Rapid systematic review: The impact of social isolation and loneliness on the mental health of children and adolescents in the context of COVID-19. *Journal of the American Academy of Child and Adolescent Psychiatry, 59*(11), 1218–1239. https://doi.org/10.1016/j.jaac.2020.05.009

Luchetti, M., Lee, J. H., Aschwanden, D., Sesker, A., Strickhouser, J. E., Terracciano, A., & Sutin, A. R. (2020). The trajectory of loneliness in response to COVID-19. *American Psychologist, 75*(7), 897–908. https://doi.org/10.1037/amp0000690

Magson, N. R., Freeman, J. Y. A., R apee, R. M., Richardson, C. E., Oar, E. L., & Fardouly, J. (2021). Risk and protective factors for prospective changes in adolescent mental health
during the COVID-19 pandemic. *Journal of Youth and Adolescence*, 50(1), 44–57. https://doi.org/10.1007/s10964-020-01332-9

Mann, L. M., & Walker, B. R. (2022). The role of equanimity in mediating the relationship between psychological distress and social isolation during COVID-19. *Journal of Affective Disorders*, 296, 370–379. https://doi.org/10.1016/j.jad.2021.09.087

Maunder, R. G., Lancee, W. J., Balderson, K. E., Bennett, J. P., Borgundvaag, B., Evans, S., & Wasylkeni, D. A. (2006). Long-term psychological and occupational effects of providing hospital healthcare during SARS outbreak. *Emerging Infectious Diseases*, 12(12), 1924–1932. https://doi.org/10.3201/eid1212.060584

Mawani, F. N., & Gilmour, H. (2010). Validation of self-rated mental health. *Health Reports*, 21(3), 61–75.

McAlpine, D. D., McCreedy, E., & Alang, S. (2018). The meaning and predictive value of self-rated mental health among persons with a mental health problem. *Journal of Health and Social Behavior*, 59(2), 200–214. https://doi.org/10.1177/0022146518755485

McGinty, E. E., Presskreischer, R., Han, H., & Barry, C. L. (2020). Psychological distress and loneliness reported by US adults in 2018 and April 2020. *JAMA*, 324(1), 93–94. https://doi.org/10.1001/jama.2020.9740

Moffitt, T. E., Caspi, A., Taylor, A., Kokaua, J., Milne, B. J., Polanczyk, G., & Poulton, R. (2010). How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychological Medicine*, 40(6), 899–909. https://doi.org/10.1017/s00332917099991036

Nicolaisen, M., & Thorsen, K. (2014). Who are lonely? Loneliness in different age groups (18–81 years old), using two measures of loneliness. *International Journal of Aging and Human Development*, 78(3), 229–257. https://doi.org/10.2190/AG.78.3.b

Pfefferbaum, B., & North, C. S. (2020). Mental health and the Covid-19 pandemic. *New England Journal of Medicine*, 383(6), 510–512. https://doi.org/10.1056/NEJMp2008017

Pierce, M., Hope, H., Ford, T., Hatch, S., Hotopf, M., John, A., & Abel, K. M. (2020). Mental health before and during the COVID-19 pandemic: A longitudinal probability sample survey of the UK population. *Lancet Psychiatry*, 7(10), 883–892. https://doi.org/10.1016/s2215-0366(20)30308-4

Rahman, M. A., Hoque, N., Alif, S. M., Salehin, M., Islam, S. M. S., Banik, B., & Cross, W. (2020). Factors associated with psychological distress, fear and coping strategies during the COVID-19 pandemic in Australia. *Globalization and Health*, 16(1), Article 95. https://doi.org/10.1186/s12992-020-00624-w

Rahman, M. A., Salehin, M., Islam, S. M. S., Alif, S. M., Sultana, F., Sharif, A., & Cross, W. M. (2021). Reliability of the tools used to examine psychological distress, fear of COVID-19 and coping amongst migrants and non-migrants in Australia. *International Journal of Mental Health Nursing*, 30(3), 747–758. https://doi.org/10.1111/inm.12845

Repon, M. A. U., Pakhe, S. A., Quaiyum, S., Das, R., Daria, S., & Islam, M. R. (2021). Effect of COVID-19 pandemic on mental health among Bangladeshi healthcare professionals: A cross-sectional study. *Science Progress*, 104(2), Article 368504211026409. https://doi.org/10.1177/00368504211026409
Reynolds, D. L., Garay, J. R., Deamond, S. L., Moran, M. K., Gold, W., & Styra, R. (2008). Understanding, compliance and psychological impact of the SARS quarantine experience. *Epidemiology and Infection, 136*(7), 997–1007. https://doi.org/10.1017/s0950268807009156

Robinson, E., Sutin, A. R., Daly, M., & Jones, A. (2022). A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. *Journal of Affective Disorders, 296*, 567–576. https://doi.org/10.1016/j.jad.2021.09.098

Simon, G. E., & Von Korff, M. (1995). Recall of psychiatric history in cross-sectional surveys: Implications for Epidemiologic research. *Epidemiologic Reviews, 17*(1), 221–227. https://doi.org/10.1093/oxfordjournals.epirev.a036180

Stubbs, J. M., & Achat, H. M. (2022). Are healthcare workers particularly vulnerable to loneliness? The role of social relationships and mental well-being during the COVID-19 pandemic. *Psychiatry Research Communications, 2*(2), Article 100050. https://doi.org/10.1016/j.psycom.2022.100050

Stubbs, J. M., Achat, H. M., & Schindeler, S. (2021). Detrimental changes to the health and well-being of healthcare workers in an Australian COVID-19 hospital. *BMC Health Services Research, 21*(1), Article 1002. https://doi.org/10.1186/s12913-021-07013-y

The Lancet. (2020). COVID-19: Protecting health-care workers. *Lancet, 395*(10228), 922–922. https://doi.org/10.1016/S0140-6736(20)30644-9

Trinh, L. T. T., Stubbs, J. M., Gilroy, N., Schindeler, S., & Achat, H. M. (2022). *Using the experiences and perceptions of healthcare workers to improve the healthcare response to the COVID-19 pandemic*. Workplace Health & Safety.

Tyler, C. M., McKee, G. B., Alzueta, E., Perrin, P. B., Kingsley, K., Baker, F. C., & Arango-Lasprilla, J. C. (2021). A study of older adults’ mental health across 33 countries during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health, 18*(10). https://doi.org/10.3390/ijerph18105090

van der Velden, P. G., Hyland, P., Contino, C., von Gaudecker, H. M., Muffels, R., & Das, M. (2021). Anxiety and depression symptoms, the recovery from symptoms, and loneliness before and after the COVID-19 outbreak among the general population: Findings from a Dutch population-based longitudinal study. *Plos One, 16*(1), Article e0245057. https://doi.org/10.1371/journal.pone.0245057

Victor, C., Grenade, L., & Boldy, D. (2005). Measuring loneliness in later life: A comparison of differing measures. *Reviews in Clinical Gerontology, 15*(1), 63–70. https://doi.org/10.1017/S0959259805001723

Victor, C. R., & Yang, K. (2012). The prevalence of loneliness among adults: A case study of the United Kingdom. *The Journal of Psychology, 146*(1-2), 85–104. https://doi.org/10.1080/00223980.2011.613875

Wang, J., Mann, F., Lloyd-Evans, B., Ma, R., & Johnson, S. (2018). Associations between loneliness and perceived social support and outcomes of mental health problems: A
systematic review. *BMC Psychiatry, 18*(1), Article 156. https://doi.org/10.1186/s12888-018-1736-5

Young, K. P., Kolcz, D. L., O’Sullivan, D. M., Ferrand, J., Fried, J., & Robinson, K. (2021). Health care workers’ mental health and quality of life during COVID-19: Results from a mid-pandemic, national survey. *Psychiatric Services, 72*(2), 122–128. https://doi.org/10.1176/appi.ps.202000424

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