


Original Research

Wellbeing and mental health outcomes amongst hospital healthcare workers during COVID-19

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Abstract

Background: Global healthcare systems have been particularly impacted by the COVID-19 pandemic. Healthcare workers (HCWs) are widely reported to have experienced increased levels of baseline psychological distress relative to the general population, and the COVID-19 pandemic may have had an additive effect. However, previous studies are typically restricted to physicians and nurses with limited data available on hospital HCWs. We aimed to conduct a cross-sectional, psychological evaluation of Irish HCWs during COVID-19.

Methods: HCWs across five adult acute level-4 Dublin-based hospitals completed an online survey of wellbeing and COVID-19 experience.

Results: There were 1898 HCWs who commenced the survey representing 10% of the total employee base. The sample comprised nurses (33%), doctors (21%), Health and Social Care Professionals (HSCPs) (24%) and 'Other' disciplines (22%), and 81% identified as female. Clinical levels of depression, anxiety and PTSD symptoms were endorsed by 31%, 34% and 28% of respondents, respectively. Professional grouping effects included: nurses reporting significantly greater levels of COVID-19 exposure, infection, COVID-fear, moral injury, and post-traumatic distress; HSCPs were significantly less likely to report mood dysfunction. In terms of gender, males were significantly less likely to report negative pandemic experiences, low resilience, and significantly more likely to endorse 'minimal' depression, anxiety, and traumatic distress. Logistic regression modelling revealed mental health outcomes (depression, anxiety and PTSD symptoms) were associated with increased frontline exposure, fewer career years' experience, elevated pre-pandemic stress, and female gender.

Discussion: To our knowledge, this is the largest evaluation of psychological wellbeing amongst HCWs in acute hospitals in the Dublin region. Our findings have implications for healthcare workforce wellbeing and future service delivery.

Keywords: Adult hospital; anxiety; COVID-19; depression; healthcare workers; Ireland; psychological wellbeing; resilience; trauma

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Introduction

COVID-19 was first identified in November 2019, in the Chinese city of Wuhan; COVID-19 spread rapidly across the globe, leading the World Health Organisation (WHO) to declare a 'public health emergency of international concern' in January 2020 (WHO, 2020a). This was revised to pandemic status on March 11th, 2020, triggering significant preventative public health measures across several continents in an effort to control the outbreak (WHO, 2020b).

Over the course of the pandemic, these measures have included unprecedented societal lockdowns, the forced closure of educational facilities and businesses, mandatory wearing of facemasks, social distancing, and in some instances, mandatory quarantining

upon entering select jurisdictions. All of these public health measures are designed to control the spread of this highly transmissible virus. Age and medical comorbidity have proven to be the greatest risk factors for morbidity and mortality risk (Verity *et al.* 2020; O'Driscoll *et al.* 2021), but infection risk poses universal concern. Early waves of the pandemic led to burgeoning case numbers, hospitalisations and deaths, with considerable additional pressure being placed on health systems. This was most evident in the early days of the pandemic from Wuhan province, China, and subsequently Bergamo Italy, followed swiftly by subsequent waves across Europe and America through 2020 and 2021.

Healthcare workers (HCWs) represent one of the groups most affected by COVID-19, particularly those with increased front line exposure to the virus (Nguyen *et al.* 2020; Mutambudzi *et al.* 2020). Clinically significant levels of depressed mood, anxiety and insomnia have been identified as the main problems experienced, particularly by frontline HCWs, with a systematic review and meta-analysis by Pappa *et al.* (2020) estimating prevalence rates at 23%, 23% and 39%, respectively. Other studies have also identified PTSD symptoms as being frequently experienced by HCWs

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(Lai *et al.* 2020; Bell & Wade, 2021; Brady *et al.* 2022). The main risk factors for experiencing significant psychological distress in HCW samples include frontline exposure, female gender, working as a nurse, being earlier in one's career, and those with a positive history of mental health difficulties (Pappa *et al.* 2020; Lai *et al.* 2020; Bell & Wade, 2021). Moreover, a survey of UK doctors by the British Medical Association (Torjesen, 2020) found that 29% of the 7821 respondents reported a worsening of their mental health during the COVID-19 pandemic. Another study of Italian healthcare workers ($N = 595$) suggested exposure to COVID-19 patients was a risk factor for elevated psychological distress (Babore *et al.* 2020). A similar survey in Spain, by Ruiz-Fernández *et al.* (2020), of 506 healthcare workers, during the highest incidence of cases and COVID-19 related mortality, revealed medium-to-high levels of compassion fatigue and 'burnout' amongst respondents, which despite being slightly different psychological constructs, still signal a psychological burden being borne by HCWs in the context of COVID-19.

Some caution is required, however, when interpreting these study outcomes as it is not possible to fully attribute the findings entirely to the current pandemic. It is well established that HCWs have elevated baseline levels of psychological distress, which precede epidemic and pandemic events (Bell & Wade, 2021). Bell & Wade's (2021) meta-analysis of 77 full-text studies examining the mental health burden of clinical staff working in high risk epidemic and pandemic health emergencies, including COVID-19 ($n = 14$), concluded that pandemic response work, including front-line exposure to infection risk, only appears to add a small additional mental health burden on clinical staff. The authors emphasise that existing high levels of poor mental health are common in acute clinical staff, irrespective of pandemic scenarios.

Whilst there is growing literature on the psychological functioning of HCWs, it's predominantly focused on medical physicians and nurses, which omits a diverse number of disciplines working in healthcare who are experiencing similar pressures. There is also a limited but growing amount of research within the Irish context, seeking to evaluate psychological wellbeing across different HCW groups, with approximately five studies appearing in the published literature to date. These include a Northern Ireland (NI) research group who surveyed staff wellbeing amongst staff across five health and social care trusts in NI (Jordan *et al.* 2021). Another group of researchers in the South-East of the country evaluated psychological functioning in HCWs across two local acute hospital settings (Ali *et al.* 2020). Foley *et al.* (2020) conducted a series of two back-to-back online survey of Irish radiographers, in the early stages of COVID-19, capturing the responses of an estimated 16% of all nationally registered radiographers. Another study by McLoughlin *et al.* (2022) has evaluated burnout, psychological wellbeing, and work satisfaction in psychiatry trainees, nationally. More recently, a Brady *et al.* (2022) evaluated the mental health of Dublin-based hospital doctors, nurses, radiographers and healthcare assistants (HCAs) across three adult hospitals, via an online, cross-sectional survey, finding high levels of psychological distress amongst their respondents. All of these studies demonstrated that surveyed Irish HCWs reported significant levels of psychological distress, thereby providing helpful estimates of psychological dysfunction amongst HCWs on the island of Ireland. Despite many similarities across these studies to our project, particularly Conan *et al.*, this study is, to our knowledge, the first and largest study to evaluate psychological wellbeing across all HCW disciplines working in acute, adult, hospital settings in the metropolitan region of Dublin.

Our study sought to evaluate the psychological functioning amongst HCWs employed across five, Dublin-based, adult, acute, level-4 hospitals. At the time this survey was live, these five hospitals were managing 50% of all COVID-associated hospitalisations nationally (HSE, 2020). The survey window described below coincided temporally with the rise of a second COVID-19 wave in Ireland.

Methods

Study design

All healthcare workers registered to work at the Mater Misericordiae University Hospital, Tallaght University Hospital, St. Vincent's University Hospital, St. James' Hospital or Beaumont's University Hospital, during the month of September 2020, were invited to complete an online survey. An electronic link directed interested candidates to a webpage, which required individuals to confirm they met eligibility criteria, satisfied themselves with participant information material, and upon clicking a consent tab, they were directed to the survey page. The survey contained four sections: demographic questions; COVID-19 related questions; four psychological questionnaires measuring anxiety, depressed mood, post-traumatic stress disorder (PTSD) symptoms, and resilience; and questions about coping behaviours.

Measures

The Patient Health Questionnaire (PHQ-9) is a clinically validated, nine-item instrument for assessing symptoms of depression (Kroenke *et al.* 2001). Scores range from 0 to 27 and scores ≥ 10 had a sensitivity of 88% and a specificity of 88% for major depression. Similar to other studies using the PHQ-9, scores were interpreted in the following way: normal (0–4), mild (5–9), moderate (10–14), and severe (15–21) depression (Lai *et al.* 2020; Zhang *et al.* 2013; Marvaldi *et al.* 2021).

The Generalised Anxiety Disorder Questionnaire (GAD-7) is a screening instrument comprising seven questions (Spitzer *et al.* 2006). Scores range from 0 to 21, with scores ≥ 10 achieving a sensitivity of 89% and a specificity of 82% for generalised anxiety. Similar to other studies using the GAD-7, scores were interpreted in the following way: normal (0–4), mild (5–9), moderate (10–14), and severe (15–21) anxiety (Lai *et al.* 2020; Jordan *et al.* 2021). Recent systematic reviews and meta-analyses show that the PHQ-9 and GAD-7 are the most frequently used questionnaires on studies evaluating HCW wellbeing (Bell & Wade 2021; Marvaldi *et al.* 2021).

The Impact of Event Scale-Revised (IES-R) is a 22-item self-report measure that assesses subjective distress caused by traumatic events (Weiss & Marmar, 1996). It is frequently used to evaluate PTSD symptoms in HCW samples (Bell & Wade, 2021; Marvaldi *et al.* 2021). Items correspond directly to 14 of the 17 DSM-IV symptom criteria of PTSD. Research has found that that a total score of >33 on the IES-R yielded diagnostic sensitivity of 0.91 and specificity of 0.82 (Creamer *et al.* 2003). Respondents are asked to name a specific traumatic event with subsequent answers reflecting how distressed or bothered they've felt by each item listed, over the previous 7 days. The instrument yields a score ranging from 0 to 88 along with subscale scores that relate to Intrusive phenomena, Avoidance, and Hyperarousal. A cut-off score of ≥ 34 has been suggested as a threshold for 'probable PTSD', as it has evidence of sensitivity (86–89%) and specificity (80–81%) in two samples of survivors of war (Morina *et al.*

Table 1. Severity categories of depression, anxiety, traumatic distress and resilience measurements in total cohort and subgroups

Severity category	Total No. (%)	Professional grouping					P value	Sex			P value	Perceived frontline exposure			P value
		No. (%)						No. (%)				No. (%)			
		Medical	Nursing	HSCP	Other	Men		Women	Low risk (0–33%)	Medium risk (34–66%)		High risk (67–100%)			
<i>PHQ-9, depression symptoms</i>															
Minimal	678 (41)	118 (39)	182 (56)	185 (49) ^a	129 (38)	.016	154 (51) ^a	519 (38)	.001	421 (48) ^a	121 (33) ^b	136 (32) ^b	.001		
Mild	484 (29)	99 (33)	149 (13)	106 (28)	93 (29)		72 (25)	407 (30)		237 (27)	121 (33)	126 (29)			
Moderate	250 (15)	38 (12)	84 (26)	46 (12)	53 (16)		38 (12)	211 (16)		108 (12) ^b	60 (17)	82 (19) ^a			
Severe	258 (16)	48 (16)	80 (25)	42 (11) ^b	57 (17)		38 (12)	214 (16)		110 (13) ^b	63 (17)	84 (20) ^a			
<i>GAD-7, anxiety</i>															
Minimal	629 (37)	126 (40)	161 (32)	151 (40)	129 (39)	.039	149 (49) ^a	476 (34)	.001	400 (45) ^a	108 (29) ^b	121 (28) ^b	.001		
Mild	486 (29)	83 (26)	155 (30)	123 (32)	88 (26)		81 (26)	402 (29)		241 (27)	113 (31)	131 (30)			
Moderate	288 (17)	50 (16)	90 (18)	61 (16)	56 (17)		39 (13)	244 (18)		126 (14) ^b	79 (21) ^a	83 (19)			
Severe	296 (17)	55 (18)	101 (20)	46 (12) ^b	61 (18)		37 (12) ^b	255 (19)		119 (13) ^b	72 (19)	105 (23) ^a			
<i>IES-R, traumatic distress</i>															
Normal	1095 (72)	217 (78)	300 (65)	277 (80)	209 (70)	.001	211 (78) ^a	875 (71)	.015	605 (79) ^a	222 (67)	267 (64) ^b	.001		
Probable PTSD	418 (28)	62 (22)	159 (35) ^a	68 (20) ^b	88 (30)		58 (22)	355 (29)		161 (21) ^b	108 (33)	149 (36) ^a			
<i>BRS, resilience</i>															
Low	396 (26)	72 (25)	114 (25)	77 (22)	92 (30)	.10	48 (18) ^b	344 (27)	.001	195 (25)	106 (31) ^a	95 (23)	.02		
Medium	816 (53)	145 (50)	255 (55)	205 (58)	144 (48)		152 (56)	659 (53)		405 (51)	172 (51)	238 (57)			
High	330 (21)	69 (25)	91 (20)	73 (20)	67 (22)		72 (26)	251 (20)		185 (24)	61 (18)	84 (20)			

PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalised Anxiety Disorder; IES-R, 22-item Impact of Event Scale-Revised (probable PTSD based on higher cut-off score of 34 or above); BRS, 6-item Brief Resilience Scale. Numbers and percentages are based on available data.

^aStatistically more likely to occupy this category.

^bStatistically less likely to occupy this category.

2013), though it's important to clarify that the IES-R is not a diagnostic instrument. This cut-off is also consistent with the scoring instructions of the IES-R and is based on a past paper examining its psychometric properties (Creamer *et al.* 2003). For these reasons it is the chosen cut-off for this study's sample, to screen for clinically elevated PTSD symptoms, though other research groups evaluating HCW wellbeing using the IES-R use lower thresholds to capture moderate (as opposed to severe) PTSD symptomatology (Lai *et al.* 2020; Jordan *et al.* 2021; Ali *et al.* 2020; Brady *et al.* 2022).

The 6-item Brief Resilience Scale (BRS) assesses the perceived ability of a person to 'bounce back' or recover from stress (Smith *et al.* 2013). It derives from the work of Carver (1998), who studied the concepts of resilience and thriving, and the potential connections between these characteristics and a person's ability to cope with adverse or traumatic events. Items require the respondent to describe their behaviour and actions on a 5-point Likert-type scale, ranging from '1' = does not describe me at all to '5' = describes me very well. Its inclusion in this study's psychometric test battery was to further explore its potential inverse relationship to mental health outcomes, though most studies in this area of the literature are primarily if not exclusively focused on mental health sequelae (depression, anxiety, PTSD symptomatology, insomnia) and not protective factors such as resilience. BRS validation studies have mostly included general population studies across (Coelho *et al.* 2016; Kunzler *et al.* 2018; Chmitorz *et al.* 2018; Fung, 2020; Soer *et al.* 2019), University students (Hidalgo-Rasmussen & Gonzalez-Betanzos, 2019), and those with varying medical conditions (Dixon *et al.* 2015; Tansey *et al.* 2016;

Rodriguez-Rey *et al.* 2016), however there is a limited but growing number of studies using the BRS to examine the role of resilience on healthcare worker wellbeing (Colville *et al.* 2017; Awano *et al.* 2020; Son *et al.* 2022; Croghan *et al.* 2021). In the original BRS validation study the unidimensional factor of BRS explained 55–67% of the variance over the four samples tested with principal component's analysis. Internal consistency reliability was good, with Cronbach's alpha ranging from .80–.91 (Smith *et al.* 2008). According to the authors of the BRS (Smith *et al.* 2013), the following score ranges represent 'low' (1–2.99), 'normal' (3–4.3), and 'high' (4.31–5) resilience, respectively.

Analysis

The analyses were conducted in three linked phases. The first phase included descriptive prevalences of depression, anxiety, PTSD symptoms and Resilience, differentiated by categorical cut-off scores. Secondly, group differences on continuous variables were examined using ANOVA, bivariate relationships between continuous variables were analysed using Pearson Correlations, and categorical variables were analysed using chi-square (see Table 1). Thirdly, All predictor variables were entered simultaneously into multivariate binary logistic regression models to examine the relation the relationship between the categorical outcomes for the psychological variables and the explanatory variables that had significant bivariate relationships with the outcomes, and the associations were reported as ORs (see Table 2). The logistic regression predicted the category of being in the clinical range for each of the psychological variables. Statistical significance

Table 2. Variables associated with mental health outcomes

Variable	B (SE)	P value	OR (95% CI)
<i>PHQ-9, depression symptoms</i>			
Female gender	0.24 (0.17)	.15	1.27 (0.92–1.77)
Age	0.014(0.01)	.32	1.01 (0.98–1.40)
Years' experience	−0.03 (0.01)	.048	0.97 (0.95–0.99) ^a
% Frontline exposure	0.01 (0.01)	.002	1.01 (1.00–1.02) ^b
COVID status: definitely +	−0.15 (0.20)	.44	0.86 (0.58–1.26)
Stress levels pre-COVID	0.02 (0.01)	<.001	1.02 (1.01–1.03) ^b
<i>GAD-7, anxiety symptoms</i>			
Female gender	0.44 (0.17)	<.001	1.54 (1.12–2.14) ^b
Age	0.14 (0.01)	.29	1.01 (0.99–1.04)
Years' experience	−0.03 (0.01)	.034	0.97 (0.95–0.99) ^a
% Frontline exposure	0.01 (0.01)	.008	1.01 (1.00–1.02) ^b
COVID status: definitely pos	−0.20 (0.19)	.31	0.82 (0.57–1.20)
Stress levels pre-COVID	0.02 (0.01)	<.001	1.01 (1.01–1.03) ^b
<i>IES-R, distress symptoms</i>			
Female gender	0.37 (0.19)	.06	1.44 (1.00–2.08)
Age	0.01 (0.02)	.63	1.01 (0.98–1.04)
Years' experience	−0.01 (0.02)	.58	0.99 (0.96–1.02)
% Frontline exposure	0.01 (0.01)	<.001	1.01 (1.00–1.02) ^b
COVID status: definitely pos	−0.06 (0.21)	.67	0.91 (0.61–1.38)
Stress levels pre-COVID	0.02 (0.01)	<.001	1.02 (1.01–1.03) ^b
<i>BRS, resilience rating</i>			
Female gender	−0.42 (0.18)	.02	0.66 (0.46–0.92) ^a
Age	−0.01 (0.02)	.50	0.99 (0.96–1.02)
Years' experience	0.03 (0.02)	.06	1.03 (1.00–1.07)
% Frontline exposure	0.00 (0.01)	.94	1.00 (1.00–1.00)
COVID status: definitely pos	0.18 (0.25)	.48	1.19 (0.73–1.95)
Stress levels pre-COVID	−0.01 (0.01)	<.001	0.98 (0.97–0.99) ^a

PHQ-9, 9-item Patient Health Questionnaire; GAD-7, 7-item Generalised Anxiety Disorder; IES-R, 22-item Impact of Event Scale-Revised; BRS, 6-item Brief Resilience Scale. ^a & ^b symbols denote negative and positive correlations, respectively, between the identified variable and relevant clinical symptoms.

was set at $p < .05$ for all analyses. As this was an exploratory research project, we did not apply the Bonferroni correction to control for multiple comparisons.

Results

Participants

A total of 1898 individuals commenced the survey and 1496 individuals completed all survey items, representing a completion-retention rate of 79%. In total, about 10% of the entire workforce across these hospitals participated in the survey, though descriptive data (described further below) of our sample suggests they're representative of the wider workforce. Participation was slightly varied across the five hospital sites, with 582 being from site A, 566 from site B, 263 from site C, 226 from site D and 194 from site E, representing participation rates of 13%, 15%, 8%, 7% and 5% of those hospitals, respectively. Sixty-seven individuals declined to

identify their site. Whilst ethics approval had been granted centrally, additional local administration clearance was required in two of the sites (sites D and E) delaying the launch of the survey in those sites by 2–3 weeks, accounting for their lower participation levels. It has also since transpired that competing surveys on a similar topic were taking place in three of the five sites evaluated in this study thereby adversely affecting participation.

Of the 1898 respondents to the survey, 1528 (81%) identified as female and the mean age of participants was 39 years (Range 18–68; SD = 10.29), which is in line with the wider health service trend. Of the 1693 for whom data is available on their hospital discipline, 566 (33%) are nurses, 350 (21%) are physicians, 408 (24%) are health and social care professionals (HSCPs), and 369 (22%) are from a range of 'other' professions including pharmacy, administration, catering, cleaning and porter services (see Table 3). Most respondents ($n = 1648$; 87%) reported working full-time. Respondents reported an average of 15 years (range = 0–46; SD = 10.12) hospital career experience.

COVID characteristics

When asked 'what percentage of your work has direct COVID-19 contact', the mean rating from 1869 responses was '39%', ranging from 0–100% (SD 31.5). ANOVA revealed significant between group differences on reported levels of frontline exposure to COVID, with nurses reporting significantly higher exposure compared to all three other groups [$F(3, 1665) = 26.60, p < .001$]. The average work-time exposure reported by nurses was 50%, compared to 34%, 35% and 36% of HSCP, medical and 'other' discipline groups, respectively. Similarly, there were significantly greater levels of 'current fear of COVID', [$F(3, 1646) = 28.14, p < .001$], and moral injury endorsement [$F(3, 1211) = 22.98, p < .001$] amongst nurses, relative to their professional peers. Fear of COVID, and 'Moral injury' were all measured using a self-report Likert scale ranging from '0' ('minimal') to '100' ('extreme'). In the case of Moral injury, this was only for individuals who endorsed 'yes' to having experienced Moral Injury after being given a brief description of it. This description read as follows: "Moral injury" is a term sometimes given to distress caused by having to make difficult decisions in the course of your work that go against your beliefs or morals. Do you feel you've been caused any 'moral injury' because of COVID-19?"

Chi-Square analyses also revealed nursing profession being associated with significantly higher incidence of confirmed positive COVID test $\chi^2 (1, n = 1669) = 68.32, p < .001, phi = 0.20$, knowing colleagues to have tested positive $\chi^2 (1, n = 1693) = 72.87, p < .001, phi = 0.21$, and being less likely to report positive experiences during COVID pandemic $\chi^2 (1, n = 1693) = 35.14, p < .001, phi = 0.14$, relative to other disciplines. Nurses were also significantly differentiated from their peers regarding reported pre-COVID stress levels [$F(3, 1589) = 3.74, p = .01$]. Similar to current fear of COVID and Moral Injury, Pre-COVID stress was measured using a self-report Likert scale ranging from '0' ('minimal') to '100' ('extreme'). Female respondents reported significantly higher levels of 'current fear of COVID' compared to their male counterparts, ($M = 39.9, SD = 23.6$ Vs $M = 31, SD = 23.3; t(1819) = 6.23, p < .001$, two-tailed) and a gender effect was also seen in relation to reported negative experiences during COVID, with significantly fewer males endorsing 'yes' to the question of whether they had negative COVID experiences $\chi^2 (1, n = 1752) = 21.7, p = .01, phi = 0.11$. Respondents had the option to elaborate qualitatively on their negative and/or positive

Table 3. Demographic and occupational characteristics of responders

Characteristic	No. (%)				
	Total	Occupation			
		Medical	Nursing	HSCP	Other
Overall		350 (21)	566 (33)	408 (24)	369 (22)
Sex					
Men	346 (18)	115 (33)	47 (8)	57 (14)	83 (23)
Women	1528 (82)	231 (67)	515 (92)	348 (86)	283 (77)
Age, years					
18–25	140 (8)	36 (11)	43 (8)	38 (10)	18 (5)
26–30	319 (18)	86 (26)	91 (17)	99 (25)	29 (8)
31–40	551 (31)	107 (32)	167 (31)	138 (35)	84 (24)
41–50	479 (27)	65 (19)	158 (30)	97 (25)	114 (33)
>51	278 (16)	43 (13)	83 (15)	20 (5)	100 (29)
Work status					
Full-time	1648 (88)	328 (94)	486 (86)	344 (85)	324 (88)
Part-time	228 (12)	20 (6)	78 (14)	61 (15)	43 (12)
Yrs' experience, years					
1–5	341 (21)	97 (32)	89 (18)	98 (26)	42 (14)
6–10	325 (20)	64 (21)	95 (20)	96 (26)	42 (14)
11–20	533 (33)	79 (26)	157 (33)	129 (35)	98 (32)
>21	414 (26)	61 (21)	141 (29)	48 (13)	127 (41)
Frontline 'COVID' exposure, %					
0	148 (8)	19 (6)	27 (4)	43 (11)	35 (9)
1–10	390 (21)	82 (24)	81 (15)	88 (22)	92 (24)
11–25	222 (12)	52 (15)	46 (8)	53 (13)	39 (11)
26–50	480 (26)	94 (27)	136 (24)	111 (27)	110 (29)
51–100	624 (33)	98 (28)	268 (48)	110 (27)	103 (27)
Acquired COVID					
Definitely yes	200 (11)	47 (14)	92 (16)	24 (6)	26 (7)
Probably yes	253 (14)	38 (11)	87 (16)	62 (15)	42 (12)
Probably not	924 (50)	184 (53)	237 (42)	236 (58)	166 (46)
Definitely not	486 (26)	76 (22)	142 (25)	83 (21)	127 (35)

Numbers in each category may vary based on those who chose not to respond to particular items and general attrition over the survey.

experiences, which will be the subject of a separate qualitative paper, but in brief there were five 'negative' themes (emotional toll, infection control concerns, challenges in supporting patients and their families, challenging workplace changes, a perceived lack of support or guidance) and four 'positive' themes (improved teamwork, flexible working, feeling appreciated, successful patient outcomes).

Psychological outcomes

Overall, considerable numbers of our survey respondents endorsed symptoms of depression (59%), anxiety (63%) and PTSD symptom levels (28%), with 26% of our sample reporting low levels of psychological resilience (See Table 1 for more details). Nurses were significantly more likely than their professional peers to endorse 'probable PTSD' (based on IES-R score of ≥ 34) on the IES-R

$\chi^2(1, n = 1380) = 26.90, p < .001, phi = 0.14$. In contrast, HSCPs were significantly less likely than other HCW groups to report probable PTSD, severe depression $\chi^2(1, n = 1509) = 12.54, p = .006, phi = 0.09$ or anxiety $\chi^2(1, n = 1536) = 9.10, p = .027, phi = 0.08$.

Gender effects were also observed. Male respondents were significantly more likely to endorse 'minimal' levels of depression $\chi^2(1, n = 1670) = 28.70, p = .004, phi = 0.13$, minimal anxiety scores $\chi^2(1, n = 1699) = 29.47, p = .001, phi = 0.13$, sub-clinical trauma symptoms scores $\chi^2(1, n = 1513) = 8.64, p = .034, phi = 0.08$, and significantly less likely to endorse low levels of resilience $\chi^2(1, n = 1542) = 18.59, p = .005, phi = 0.11$, compared to their female counterparts.

Factors predicting mental health outcomes

Variables that had independent statistically significant bivariate relationships with the mental health outcomes were entered into a logistic regression model. The outcomes were categorised into clinical levels of (1) depressed mood (PHQ score of ≥ 10), (2) anxiety (GAD score of ≥ 10), (3) PTSD symptom distress (IES-R score of ≥ 34), or (4) low resilience (BRS score of ≥ 3) using the cut-offs proposed by the scales' developers. Clinical elevations of depressed mood were associated with increased frontline exposure (OR, 1.01: 95% CI, 1.00–1.02; $p = .002$), higher pre-pandemic stress (OR, 1.02: 95% CI, 1.01–1.03; $p < .001$), and fewer years of professional experience (OR, 0.97: 95% CI, 0.95–0.99; $p = .048$). Clinical anxiety was associated with those identifying female gender (OR, 1.54: 95% CI, 1.12–2.14; $p < .001$), higher pre-pandemic stress (OR, 1.01: 95% CI, 1.00–1.02; $p < .001$), increased frontline exposure (OR, 1.01: 95% CI, 1.00–1.02; $p = .008$), and fewer years of professional experience (OR, 0.97: 95% CI, 0.95–0.99; $p = .034$). PTSD symptom distress was associated with increased levels of frontline exposure (OR, 1.01: 95% CI, 1.00–1.02; $p < .001$) and higher pre-pandemic stress (OR, 1.01: 95% CI, 1.00–1.03; $p < .001$). Lower levels of resilience were associated with female gender (OR, 0.66: 95% CI, 0.46–0.92; $p = 0.02$) and higher reported pre-pandemic stress (OR, 0.98: 95% CI, 0.97–0.99; $p < .001$). Pre-pandemic stress was measured by asking respondents the question 'how would you rate your stress levels before the COVID-19 pandemic' using a Likert scale from '0' (minimal) to '100' (extreme). Whilst other studies have reported BRS measured resilience mediate the relationship between psychological symptomatology and wellbeing (Awano *et al.* 2020; Son *et al.* 2022), our study did not replicate these findings.

Coping behaviours

Whilst a fine grained qualitative analysis of coping styles is beyond the scope of this paper, a brief overview of reported coping behaviours is described here. There were two main coping related questions, one directed at personal coping and the other asked about organisational level supports. In response to the first, 'How have you coped with stress? (Open question)', respondents provided myriad answers. Exercise was cited as the most popular ($n = 692$), followed by friendships ($n = 356$), family support ($n = 276$), mindfulness/meditation ($n = 174$) and reading ($n = 114$). The next most popular coping methods included distraction ($n = 78$), music ($n = 71$), yoga ($n = 71$), gardening ($n = 41$) and cooking/baking ($n = 41$). Twenty-seven individuals acknowledged attending counselling for support. In response to the question 'which workplace resources have you accessed to cope with stress?' 'Peers' was the most endorsed option ($n = 1102$), followed by manager support

($n = 198$), occupational health ($n = 107$), accessing the employee assistance programme ($n = 95$), receiving psychology led resilience training ($n = 94$) or online resources provided by their organisation ($n = 74$). Over 279 respondents acknowledged receiving 'other' non-specified forms of organisational support.

Discussion

To our knowledge, this is the first study to evaluate the psychological wellbeing of all healthcare workers in a network of acute, adult, hospitals in the Dublin region, where approximately one-quarter of the population reside. These hospitals have managed varying levels of COVID-19 related hospitalisations throughout the pandemic, ranging from 50% at the time of this survey to over 26% of admissions in late 2021. Our study revealed relatively high rates of psychological distress amongst respondents, with 31% falling into the moderate-to-severe range for depression on the PHQ-9, 34% reporting moderate-to-severe anxiety on the GAD-7, and 28% endorsing probable PTSD on the IES-R, using the higher cut-off. This suggests that approximately one-in-three healthcare workers are reporting clinical levels of depression, anxiety and/or PTSD symptomatology. This appears to be differentiated from general population mental health estimates during COVID-19, across both Irish and UK jurisdictions, at least in terms of anxiety and depressed mood. Hyland *et al.* (2020) found prevalence rates of clinical anxiety and depression to be 20% and 22.8%, respectively, using the same cut-offs as our study, amongst a sample of 1041 general population members in the Republic of Ireland. Similarly, Shevlin *et al.* (2020) found prevalence rates of 21.6% and 22.1%, for anxiety and depression respectively, in a UK adult sample ($N = 2025$). Whilst they also reported a lower incidence of 'traumatic stress' in their sample (16.8%), they used a different psychometric questionnaire to evaluate this called the International Trauma Questionnaire, which is based on ICD-11 PTSD symptom criteria (Cloitre *et al.* 2018). It is also noteworthy that one in five of our sample (21%) scored in the low range for resilience, as measured by the BRS, which has been found to mediate mental health outcomes in other studies, though not in our sample.

Whilst these estimates broadly mirror other studies evaluating mental health outcomes in HCWs, internationally, they appear at the upper end of the existing literature for depressed mood and anxiety. It's unclear why this might be, although a response bias effect might form part of the explanation. By way of comparison, Lai *et al.* (2020) reported 15%, 12% and 35% prevalence rates for depressed mood, anxiety and PTSD type symptoms, using the same psychometric measures amongst Chinese doctors and nurses in December 2019. It is likely that their lower anxiety and depression scores is partly due to a higher participation rate (64.7%), thus limiting a response bias, though their higher estimate of PTSD symptom distress is due to their lower cut-off score threshold on the IES-R (cut-off score of 26 versus 34). Another UK research group studying many healthcare disciplines across three London based NHS trusts during spring 2020 (Lamb *et al.* 2021), found 27%, 23% and 30% of their respondents endorsing clinically significant depression, anxiety and PTSD symptomatology, respectively. This UK survey had a 12% response rate, which is relatively similar to our study. The authors measured PTSD symptomatology differently by way of a shorter, screening questionnaire often used in primary care settings (Lang & Stein, 2005), though found comparable levels of PTSD type endorsements. Similarly, a Northern Irish research group found comparative rates of

depressed mood, anxiety and PTSD symptoms amongst their survey respondents, which they ran across two different time-points, with a 4-month interval between surveys (Jordan *et al.* 2021). In November 2020 (time-1), 30%, 26% and 30% of their respondents ($n = 3834$) endorsed clinically significant levels of depression, anxiety and 'post-traumatic stress', respectively. By February 2021, 36%, 27% and 32% of their 2898 respondents endorsed clinically significant depression, anxiety and post-traumatic stress. The response rates to each survey were 4.9% at Time-1 and 3.7% at Time-2, which also appears suggestive of an elevated symptom profile being associated with a risk of response bias. Whilst the Northern Irish study used the same measures as this study for depression, anxiety and PTSD symptomatology, the lower cut-off score of '26' was used on the IES-R, which appears to have resulted in higher estimates of PTSD symptom levels.

Our data also reveals additional professional grouping and gender effects. Those in the nursing profession appear most at risk of mental health difficulties, endorsing significantly greater levels of PTSD symptoms than their HCW colleagues. Similarly, they report significantly greater levels of 'current' COVID-fear, moral injury, frontline exposure, incidence of infection, and rather interestingly, pre-COVID stress, and significantly fewer positive experiences during the pandemic. As mentioned previously, a separate qualitative analysis of these answers identified four main, positive, pandemic-experience themes: improved teamwork, flexible working, feeling appreciated, and successful patient outcomes. The cross-sectional nature of this study precludes us from making causal inferences but these factors are likely to be relevant and central to any ameliorative measures that might help to address these issues in HCW samples. To this end, however, our logistic regression models identified factors that predict clinical mental health reports across our overall sample. Reported frontline exposure and higher levels of pre-pandemic stress were common factors across depression, anxiety and trauma domains, with fewer years of professional experience also predicting depression and anxiety. Female gender also predicted elevated anxiety and lower resilience.

It is also noteworthy that HSCPs appear the most 'protected' professional grouping, comparatively speaking, though they comprise an amalgam of 26 different professions, several of which are not exposed to the clinical coalface, which might account for some of these findings. A detailed breakdown of HSCP professions is beyond the scope of this paper's focus but would likely shed light on differences across individual disciplines. In terms of gender, male respondents were significantly less likely to report negative COVID experiences or to endorse low levels of resilience. Males were also significantly more likely to exhibit healthy scores on measures of depression, anxiety and PTSD symptoms. It's unclear why this is though it's possible that there is a collinearity effect with the nursing profession, which is predominantly female. Recent research has found that Irish females were significantly more likely to screen positive for depression and anxiety during the COVID-19 pandemic, which the authors attribute to multiple psychosocial factors including higher trait neuroticism in females, higher levels of loneliness, increased prevalence of somatic problems, increased child caring pressures, lower sleep quality, and lower trait conscientiousness (Vallières *et al.* 2022). Some of these issues were quite relevant for healthcare workers during early stages of the pandemic, particularly child care pressures and not having the option to work from home. Similar factors are likely to account for some of our sex differentiated findings.

Our study cohort appears healthily representative of the true health service workforce. The study sample is 81% female, which is broadly in line with an October 2021 HSE National Workforce Personnel and Census Report (2021) describing 79% of the workforce being female. Our response rate was also 10% which compares favourably with similar studies from the NI and England (Jordan *et al.* 2021; Lamb *et al.* 2021), who had participation rates of <5% and 12%, respectively, and indeed other studies in these jurisdictions, though there is likely to be an element of response bias. Our findings also appear consistent with the literature, thus providing further support to the validity of our findings, though continued research efforts to capture larger HCW samples is merited.

Implications

The implications of our findings are stratified across different levels. Our data reveal a concerning profile of psychological distress across our acute hospital workforce. These individuals deserve, and are likely to benefit from, a suite of measures that are designed to support them individually, and address broader managerial, systemic and/or organisational level issues that are probable factors in accounting for some of our findings. Whilst the focus of this study has been psychological wellbeing in the context of COVID-19, there are clear indications that this is not entirely attributable to COVID-19 related stressors. The ongoing systematic review and meta-analysis of Bell & Wade (2021) also demonstrates that baseline rates of poor mental health are already high amongst HCWs across different jurisdictions, spanning many epidemic and pandemic events, which they conclude are only marginally additive in terms of psychological harm. There is ample evidence that problematic levels of psychological distress preceded the COVID-19 pandemic and will indeed persist afterwards. On this basis, a longer term strategy of HCW wellbeing is required and it is a stated organisational priority for the HSE (2018). Engaging health staff and boosting staff morale is central to improving quality service delivery across the health service sector. Meaningful staff engagement policies has been shown to be associated with improved clinical outcomes for patients, more positive patient experiences, better health and safety records and higher levels of retention and innovative work practices (HSE, 2018). Given our findings, there might be merit in having a tailored response to our nursing colleagues, who appear at increased risk of psychological distress compared to other professional disciplines. Emerging evidence suggests there are myriad protective measures to improve HCW wellbeing across four main strands: improved, more-efficient, team-based, work-flow interventions; technological innovation designed to reduce administration burden on clinicians; enhanced clinical supports such as embedded organisational measures; and supported, funded, clinical training opportunities, particularly those that support HCWs in managing change, systems improvement, leadership, and building strong organisational cultures (Rotenstein *et al.* 2022; Daniels *et al.* 2021). These interventions will relate to varying degrees across HCW disciplines.

Limitations

There are several limitations of this study. It's cross-sectional nature precludes causality from being determined. However, it is consistent with other literature and, indeed, emerging longitudinal data from NI, highlighting elevated baseline levels of distress and heightened risk from frontline exposure. Furthermore, given our

online survey methodology, there is also the potential for self-selection bias, which risks inflating the problems that actually exist in real world terms. Our sample constituted 10% of the overall workforce and it is possible that those who elected to participate were motivated by a willingness to report on their mental health experiences. However this limitation may be partially offset by the following observations: a 10% response rate compares relatively favourably with other studies on this topic (Jordan *et al.* 2021; Hyland *et al.* 2020); our outcomes appear consistent with the related literature from neighbouring and distant jurisdictions (Lai *et al.* 2020; Jordan *et al.* 2021; Hyland *et al.* 2020); and our sample's gender ratio appears broadly in line with that of the overall health service. Nonetheless it would remain prudent to interpret this study's findings with caution.

Conclusions

Similar to other jurisdictions, Irish HCWs appear to also endorse relatively high levels of mental health symptomatology during the COVID-19 pandemic. This study's findings are comparable to other surveys on HCWs in Ireland, the UK and elsewhere, with approximately one-in-three survey respondents endorsing clinically significant levels of depressed mood, anxiety and/or PTSD symptoms. Risk factors for these mental health outcomes include increased frontline exposure, fewer career years' experience, elevated pre-pandemic stress, female gender, and working in the nursing profession. This study joins many others in the related literature signalling a need for health services to address these issues to protect it's staff, optimise health service delivery and ensure quality patient care.

Supplementary material. To view supplementary material for this article, please visit <https://doi.org/10.1017/ipm.2023.1>

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Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committee on human experimentation with the Helsinki Declaration of 1975, as revised in 2008. The study was approved by the National Research Ethic Committee (20-NREC-COV-085) in August 2020.

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