RESEARCH ARTICLE

A cross-sectional study of the psychosocial and occupational impact of COVID-19 among NHS staff: findings from a Northwest London cohort during the second wave [version 1; peer review: awaiting peer review]

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Abstract

Background: Evidence of the deleterious mental health impact of COVID-19 on healthcare workers shows the priority need to support their psychological wellbeing. We assessed the nature, prevalence and factors associated with the psychosocial and occupational impact of COVID-19 among NHS staff during the pandemic.

Methods: A cross-sectional online survey was sent to all NHS provider organisations in Northwest London in January 2021.

Results: Of 1,065 participants completing the survey, 906 (85%) provided responses to the full survey. Over half (54.1%; n=543) exceeded the cut-off score for probable mental disorders, 31.1% (n=222) for probable burnout, and similarly for PTSD (28.5%; n=210). 28.6% (n=214) had experienced suicidal thoughts. 58% (n=429) scored >5 out of 10 for emotional and physical exhaustion. Over 30% (n=328) of respondents reported using some kind of staff support service. Staff in pay bands 4-6 were more likely to have common mental disorders (CMD) (OR 2.42 [1.20,4.88]) and PTSD symptoms (OR 4.18 [1.44,12.14]) than lower banded staff. Staff working in acute care settings were more likely to experience CMD (OR 1.50 [1.08,2.07]) and PTSD (OR 1.57 [1.03,2.41]) than in non-acute settings. Low social connectedness and perceived delivery of poor-quality care were highly associated with risk of all mental health problems, apart from alcohol misuse (OR range 1.56-18.34).

Conclusions: Psychosocial morbidity and adverse occupational impacts on NHS staff in the second wave of the COVID-19 pandemic echoed that reported in the first wave. Social connection and perception of delivering good care were important, potentially modifiable, mitigating factors.

Keywords

COVID-19, psychosocial, occupational, impact, National Health Service,
United Kingdom

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Introduction

Key workers in occupations and industries central to the COVID-19 pandemic response accounted for approximately a third (10.6 million) of the total UK workforce, social care and healthcare workers (HCWs) comprising the largest percentage (Office of National Statistics, 2020). The deleterious impact of COVID-19 upon the mental health and wellbeing of HCWs is well documented (e.g., da Silva and Neto, 2021). This results partly from feelings of heightened viral vulnerability (Vindrola-Padros et al., 2020), redeployment to roles outside of trained professional boundaries (San Juan et al., 2020), entailing actions, or the lack of them, that risk violating someone's moral or ethical code (i.e., moral injury) (Greenberg et al., 2020; Litz et al., 2009) and changing care guidelines (San Juan et al., 2020).

The consequences include stress, anxiety, and depressive symptoms (Krishnamoorthy et al., 2020; Shreffler et al., 2020), suicidal ideation and increased vulnerability to developing post-traumatic stress disorder (PTSD) and post-traumatic stress symptoms (PTSS) (D'Ettorre et al., 2021). Multiple risk factors for heightened mental health impact have been suggested, including ethnicity (Gilleen et al., 2021), exposure level (Muller et al., 2020), duration of work experience (Elbay et al., 2020), social and work support (Khajuria et al., 2021; Liu et al., 2020; Ni et al., 2020), job role (especially nursing) (Al Maqbali et al., 2021; Cabarkapa et al., 2020; Lai et al., 2020), age (Evanoff et al., 2020), gender (especially female) (Cabarkapa et al., 2020), marital status (Di Tella et al., 2020), and coping styles (Carmassi et al., 2020).

Evidence from past pandemics—SARS, MERS, Ebola, swine flu—shows HCWs who have dealt with serious infection are at increased risk of both current and subsequent mental health problems (Brooks et al., 2019). The pervasive and profound impact of large-scale viral outbreaks on HCWs' mental health (Busch et al., 2021), and the chronicity of psychiatric morbidities (Chau et al., 2021), means the need to support their short-, medium- and longer-term psychological wellbeing is increasingly a priority. Research is needed to explore the type and effectiveness of appropriate interventions to address staff support needs. Evidence on individual and organisational interventions that can mitigate potential adverse psychological effects and improve, restore and preserve workforce wellbeing — thereby increasing individual resilience—is, however, limited (Heath et al., 2020). Common ways of supporting staff are ineffective and detrimental (e.g., psychological debriefing) (Brooks et al., 2019); on the other hand, monitoring followed by a screen-and-treat approach is effective in community settings (Brewin et al., 2008). The pandemic's trajectory suggests the psychological challenges faced by HCWs will differ from previous episodes, in nature and scale.

The *MeCare* study in Northwest London (NWL), using the protocol developed for the *NHS Check* study (Lamb et al., 2021), assessed the nature and prevalence of, and factors associated with, the psychosocial and occupational impact of COVID-19, to determine the need for supportive mental health interventions, among UK NHS staff. As an area with a highly diverse work force, the study specifically aimed to examine the role of ethnicity, professional grade, and role (i.e., clinical versus non-clinical), and explore possible mitigating factors, such as social connectedness and self-perceived quality of the care staff members provide.

Objectives

To assess the nature and prevalence of, and factors associated with, the psychosocial and occupational impacts of COVID-19, and describe use of existing staff mental health support programmes.

Methods

Study design

The study used a cross-sectional study design.

Setting

The study used an online survey. The recruitment and data collection period took place during the second COVID-19 wave (Jan–April 2021).

Participants

Eligible participants were health staff members currently employed by the NHS, aged 18 and over, and working within the geographic area covered by nine NHS Trusts in NWL. Potential participants were identified and recruited via trusts' internal human resource systems, with existing dedicated emails distributing explanatory invites to staff at the respective sites and providing a link to the study website for the survey. A specific study email was set up for participants' questions. Website information reinforced the fact that participation was entirely voluntary, and that no study data would be identifiable to anyone outside the immediate research team. The website was advertised by posters around the sites, verbally promoted during staff support sessions offered, in email signatures, via social media, Primary Care Networks and GP practice manager communication, trade union organisations, professional organisations and Royal Colleges, newsletters and magazines and ethnic minority networks. As a result of the range of distribution methods used across

the participating organisations, estimating the exact number of individuals invited to participate is difficult. The organisations collectively employ around 40,000 staff who may have been eligible to participate.

Ethics approval
The study was approved by the Imperial College Research Ethics Committee (ICREC reference number: #20IC6241) and Health Regulator Authority (IRAS reference number: 20/PR/0828). Participants provided informed online consent, including for publication, after the survey had been explained to them in an online document.

Variables
The survey was comprised of two parts (a short and long survey).

(i) *Short baseline survey*

This survey had two components: socio-demographic and psychological. All participants were asked to complete a 5-10 minute questionnaire and given the option of completing a supplementary longer questionnaire.

The short baseline survey included information on respondents' contact details (e.g., name, work and personal email address, phone number), occupational information (e.g., occupational group, length of professional registration, usual place of work), demographics (e.g., age, gender, relationship status), and a few short questionnaires concerning occupational and social support available, general health, and information on direct and indirect experience of the pandemic – e.g., participant or family members becoming ill, caring responsibilities and institutional support during the pandemic. The psychological component of the survey included the 12-item General Health Questionnaire (GHQ-12), to screen for general (non-psychotic) psychiatric morbidity (Goldberg and Williams, 1988).

(ii) *Long baseline survey*

The optional longer survey included psychological outcome measures to assess resilience, anxiety, depression, wellbeing, moral injury, burnout, fatigue, suicidal ideation and self-harm, alcohol use, and PTSD (details on measures are given below). Participants were also requested to detail support they were receiving or had been provided by indicating the nature of that support categorised by intervention type.

Data sources/measurement
Study tools included standard question sets with established scoring rules that generate validated measures of mental health morbidity and related study areas of concern: 12-item General Health Questionnaire (GHQ) (Goldberg and Williams, 1988); 6-item Brief Resilience Scale (BRS) (Smith *et al.*, 2008); 7-item Generalised Anxiety Disorder (GAD-7) (Spitzer *et al.*, 2006); 9-item Patient Health Questionnaire (PHQ-9), measuring depression (Kroenke *et al.*, 2001); 14-item Warwick-Edinburgh Mental Well-being Scale (WEMWBS) (Tennant *et al.*, 2007); 9-item Moral Injury Event Scale (MIES) (Nash *et al.*, 2013); 12-item Burnout Assessment Tool (Schaufeli *et al.*, 2019); 3-item Clinical Interview Schedule-Revised (CIS-R) (Lamb *et al.*, 2021); 10-item Alcohol Use Disorder Identification Test-C (AUDIT) (Babor *et al.*, 2001); 6-item PCL-6 civilian version to explore PTSD (Lang and Stein, 2005). This paper omits data from the BRS, MIES and WEMWBS.

Addressing potential source of bias
As the sample is self-selecting, it is possible that participation may be correlated with outcome and/or exposure variables, adversely affecting the generalisability of results to the eligible population. The direction of any such selection bias is difficult to predict, as a plausible case can be made for either under- or over-representation of mental health morbidity in the sample. Efforts to improve the generalisability of the sample and minimise selection bias include the range of methods by which the study was advertised, the information provided to participants on the study website, and the splitting of the survey into the core "short" and optional "long" versions.

To control for potential bias due to confounding of the associations of interest with other variables, covariate-adjusted models were fitted (see below under Multiple Regression Model).

Study size
The primary outcome was common mental disorder, as measured by a GHQ-12 score greater than 4. Mean GHQ-12 scores in the UK increased from 1.8 to 3.8 during the pandemic, and the average was higher still for key workers and

individuals from ethnic minority backgrounds (Fujiwara *et al.*, 2020). Preliminary results from the *NHS Check* study (Lamb *et al.*, 2021), using the same survey in a similar population, suggested the prevalence of common mental disorders in the study sample may be as high as 60%.

We estimated that a sample size of 650 would provide at least 80% power at the 95% significance level to detect an absolute difference of 12% in prevalence between groups based on survey responses; 70% power to detect a difference of 11%; and 50% power to detect a difference of 9%. These figures assume that groups may differ in size by a factor of 3; to the extent that numbers in the groups are more evenly matched, power will be somewhat improved.

Objectives

The three analysis objectives were to:

1. Describe the baseline demographic characteristics of the sample cohort;

2. Describe the distribution of key mental health outcomes and related variables of interest, and;

3. Compare cohort subgroups with regard to the primary mental health outcomes.

Descriptive analyses

Employing statistical software (R 4.0.3), descriptive statistics were used for socio-demographic data. Summarized distributions of each outcome in the overall study sample are presented. Mean, standard deviation and 95% confidence interval (CI) are presented for continuous/numerical variables, including all validated and novel composite scores (the latter is discussed below). The number of cases and their prevalence are reported for binary variables, and the number and proportion in each category for ordinal or other categorical variables. For the validated mental health measures, both the numerical score and the derived binary variable are shown.

Comparative analyses

Outcomes were compared cross-sectionally in accordance with the following contrasts:

- Participants who came into contact with those with suspected COVID-19 symptoms vs participants who did not;

- Participants working in acute care settings vs participants working in other settings;

- Clinical vs non-clinical staff;

- Ethnic minority vs non-ethnic minority participants;

- Participants with higher vs lower social disconnection scores, and;

- Participants with higher vs lower quality of care provision scores.

Comparisons were performed for the following outcomes: all binary outcomes derived from validated mental health scores, and a binary indicator for use of any staff support programme. Missing responses were excluded from the analysis on an outcome-by-outcome basis.

Unadjusted comparisons

For each outcome and contrast, an unadjusted odds ratio and 95% CI is presented.

Multiple regression model

A multiple logistic regression model was fitted for each outcome, using as covariates all of the contrasts listed above (except age, which was included as a continuous covariate) together with the demographic variables collected in the short-form baseline survey and the novel scores for quality-of-care provision and social disconnection.

The quality-of-care provision score was based on the set of questions: "In the past 2 weeks … - I have had to do work I do not feel sufficiently competent or trained to do", "In the past 2 weeks … - I or my team have had to provide significantly

worse care than usual to our patients or deny them treatment that would normally be available", and "In the past 2 weeks … - I have felt let down because I am working with insufficient staffing or resources." Each question took the possible answers "Never", "Rarely", "Sometimes", "Often", or "Always".

The social disconnection score was based on the set of questions: "Since the COVID-19 (coronavirus) pandemic - How well do you feel supported by your family and/or friends?", "Within the last few weeks: - Do you feel more isolated from family/friends because of your work role?", "Within the last few weeks: - Do you feel like friends, family or strangers are treating you differently (positively) because you work in a hospital/care setting?", and "the last few weeks: - Do you feel like friends, family or strangers are treating you differently (negatively) because you work in a hospital/care setting?" Each question took the possible answers "Not at all", "A little bit", "Moderately", "Quite a bit", or "Extremely".

In both cases the composite score was derived by applying Likert scoring (0-4, where a higher score indicates a less favourable response) to each question and summing the result within each set. Social connectedness was therefore scored between 0 and 16, and quality of care provision between 0 and 12. Categorical variables based on these ranges were then included as predictors in the model (see Table 5 for details).

The full list of regression covariates is shown in Table 5. We explored the use of a linear mixed model with a random intercept for each participating employing organisation (and fixed effects for the covariates) to allow for additional variability of outcomes between organisations; however, the random effects were not significant, and therefore a fixed intercept model was used instead. In the multiple regression analysis, for each covariate a separate category was included for responses indicating uncertainty or unwillingness to indicate a category, such as "Don't know", "Unsure", "Other" or "Prefer not to say". Missing values for the social disconnection and quality-of-care scores were also treated as a separate category. For other covariates the level of missingness was very low and participants with missing values were excluded.

Significance testing

A 95% confidence interval is presented for each studied mean score, prevalence and relative effect measure. Regression coefficients were annotated to indicate the statistical significance according to the magnitude of the P-value, i.e., *=P<.05, **=P<.01, ***=P.001.

Results
Participants
A total of 1,065 participants completed the baseline survey, with 159 (15%) completing the short survey only, and 906 (85%) also providing responses to the long survey.

Descriptive data
Participants' socio-demographic and role profile

The characteristics of the study sample are shown in Table 1. A greater proportion of participants were aged 30-59 years (72%; n=755), female (76%; n=806), in some form of relationship (68%; n=726), with a greater proportion on bands 7-9 of the Agenda for Change pay rate scale (26%; n=276) and had been working for their current employer for between 1-5 years (43%; n=454).

Outcome data and main results
Prevalence of adverse mental health outcomes

The prevalence of mental health scores exceeding the cut-off for probable morbidity are shown in Table 2 along with the mean and standard deviation of the raw scores. Over half (54.1%; n=543) of respondents exceeded the cut-off score on the GHQ-12 for probable mental disorders, and approximately a quarter for anxiety (GAD-7, 25.8%; n=191). Approximately 30% exceeded the cut-off point for probable depression (PHQ-9, 29.8%; n=219), and similarly for probable burnout (31.1%; n=222) and PTSD (31.7%; n=189). Just over a tenth (10.6%; n=78) recorded probable alcohol misuse.

Suicidal thoughts/self-harm
From the Clinical Interview Schedule (Goldberg and Williams, 1988), nearly three-tenths (28.6%; n=214) of respondents had experienced suicidal thoughts, with one in ten (9.9%; n=74) reporting suicidal ideation in the last two months; 1.7% (n=13) had made an actual attempt on taking their own life in the previous two months. Over one in ten (11.5%; n=86) reported ever harming themselves but not with the intention of killing themselves, with 2.5% (n=19) reporting doing so in the last two months.

Table 1. Socio-demographic characteristics of the sample.

Variable	n (%)
Age (n=1,052, 99% non-missing)	
<20	6 (<1%)
20-29	175 (17%)
30-39	261 (25%)
40-49	242 (23%)
50-59	252 (24%)
≥60	116 (11%)
Mean	43.14
Standard deviation	12.42
Gender (n=1,065, 100% non-missing)	
Female	806 (76%)
Male	252 (24%)
Other/Prefer not to say	7 (1%)
Relationship status (n=1,062, >99% non-missing)	
Single	264 (25%)
In a relationship/cohabiting/married	726 (68%)
Divorced /separated/widowed	72 (7%)
Ethnicity (n=1,064, >99% non-missing)	
Asian (includes Arab)	293 (28%)
Black	51 (5%)
White	652 (61%)
Mixed/Other	68 (6%)
Main role (n=1,065, 100% non-missing)	
Non-clinical	477 (45%)
Clinical	588 (55%)
Agenda for Change pay rate (n=1,065, 100% non-missing)	
Bands 1-3	57 (5%)
Bands 4-6	220 (21%)
Bands 7-9	276 (26%)
Not applicable or Student	262 (25%)
Don't know or prefer not to say	250 (23%)
Length of time at current employer (n=1,060, >99% non-missing)	
<1 year	162 (15%)
1-5 years	454 (43%)
6-10 years	147 (14%)
11-19 years	151 (14%)
≥60 years	146 (14%)

Staff fatigue

Table 3 summarises the responses to three survey items on fatigue. Fifty-eight percent (n=429) of respondents scored 5-8 when grading their emotional and physical exhaustion. Approximately 1 in 6 (16.8%; n=125) scored 9-10, the extreme end of the severity scale. Respondents also reported not only was this fatigue significantly greater than their usual tiredness (67.2%; n=477), but over half (51.4%; n=376) said it interfered with their ability to do things.

Table 2. Prevalence of key mental health outcomes.

Outcome (measure)	Number of responses	n (%) exceeding cut-off	Mean score (standard deviation)
Probable MH disorders (GHQ-12: cut off ≥4, range 0-12)	1,004	543 (54.1%)	4.75 (3.84)
Probable anxiety (GAD-7): cut off ≥10, range 0-28)	741	191 (25.8%)	6.57 (5.29)
Probable depression (PHQ-9 cut off ≥10, range 0-36)	736	219 (29.8%)	7.19 (5.99)
Probable burnout (BAT cut off ≥2.59, range 1-5)	713	222 (31.1%)	2.28 (0.79)
Probable alcohol misuse (AUDIT: cut-off ≥8, range 0-45)	734	78 (10.6%)	3.27 (3.97)
Probable PTSD (PCL-6: cut off ≥14, range 6-30)	736	210 (28.5%)	11.34 (5.07)

Table 3. Prevalence of fatigue.

Question	Number of responses	n (%)
Please use a scale from 0 (=Not at all) to 10 (=Extremely) to answer the question below: - I am emotionally and physically exhausted	746	0-3: 86 (11.5%)
		3-4: 106 (14.2%)
		5-6: 171 (22.9%)
		7-8: 258 (34.6%)
		9-10: 125 (16.8%)
		Mean (standard deviation): 6.07 (2.60)
Is the fatigue you are experiencing significantly greater than the tiredness you usually feel?	710	Yes: 477 (67.2%)
		No: 233 (32.8%)
Does the fatigue you are experiencing interfere with your ability to do things?	732	Yes: 376 (51.4%)
		No: 356 (48.6%)

Alcohol use

While more than 1 in 6 (17.1%; n=110) respondents reported drinking more alcohol in the past week than they would have typically before the pandemic, 82.9% (n=533) reported consumption levels that were either the same (41.7%; n=268) or less than usual (41.2%; n=265).

Staff support services

Table 4 shows the number and proportion of survey respondents indicating they had used various types of staff mental health support measures, as well as the number and proportion giving a "Not applicable" response.

Table 4. Employee support measures used.

Support type	n (%)
Employee Assistance Programmes	72 (6.8%)
Wellbeing activities (e.g., mindfulness, relaxation etc.)	200 (18.8%)
Helplines	44 (4.1%)
Relaxation/timeout areas	127 (11.9%)
Psychological therapy/counselling	32 (3.0%)
Self-help digital tools	14 (1.3%)
(Indicated at least one of the above)	328 (30.8%)
Not applicable	68 (6.4%)

Note: Respondents could select more than one support type.

Table 5. Logistic regression results.

Odds ratio [95% CI] associated with outcome:

Predictor/ covariate	Probable MH disorders (GHQ-12 ≥4) N=980		Probable anxiety (GAD-7 ≥10) N=722		Probable depression (PHQ-9 ≥10) N=713		Probable burnout (BAT ≥2.59) N=694		Probable alcohol misuse (AUDIT ≥8) N=710		Probable PTSD (PCL-6 ≥14) N=717		Used any staff support N=1,033	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Age														
Each additional year		0.99 [0.98,1.01]		**0.98 [0.96,1.00]**		1.00 [0.98,1.02]		**0.98 [0.96,0.99]**		1.00 [0.97,1.02]		0.98 [0.96,1.00]		0.99 [0.98,1.01]
Gender														
Female (R)		1		1		1		1		1		1		1
Male		0.76 [0.54,1.08]		0.79 [0.50,1.25]		0.96 [0.60,1.55]		0.86 [0.55,1.34]		1.59 [0.87,2.90]		0.69 [0.43,1.10]		***0.61 [0.43,0.88]***
Other/prefer not to say		0.72 [0.08,6.56]		0.54 [0.05,5.49]		NA†		NA†		NA†		1.64 [0.23,11.6]		1.30 [0.19,9.12]
Relationship status														
Married/In a relationship (R)		1		1		1		1		1		1		1
Single		0.84 [0.58,1.20]		0.65 [0.42,1.01]		0.85 [0.56,1.28]		0.94 [0.62,1.44]		0.92 [0.50,1.72]		1.18 [0.77,1.80]		0.92 [0.66,1.29]
Divorced/ separated/ widowed		1.09 [0.60,2.00]		1.72 [0.84,3.53]		1.81 [0.90,3.64]		1.24 [0.55,2.77]		0.85 [0.27,2.64]		1.94 [0.93,4.08]		0.72 [0.39,1.33]
Ethnicity														
White (R)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Minority ethnicity (non-white)	***0.57 [0.44,0.74]***	0.80 [0.55,1.15]	0.74 [0.52,1.06]	0.96 [0.59,1.57]	***0.63 [0.44,0.89]***	0.95 [0.59,1.52]	0.85 [0.61,1.20]	1.08 [0.67,1.74]	***0.25 [0.13,0.50]***	***0.19 [0.08,0.45]***	0.78 [0.56,1.11]	0.89 [0.54,1.47]	0.81 [0.62,1.07]	1.20 [0.84,1.72]
Country of birth														
UK (R)		1		1		1		1		1		1		1
EU (not UK)		0.89 [0.54,1.46]		1.15 [0.64,2.05]		0.74 [0.41,1.34]		0.85 [0.46,1.56]		0.43 [0.16,1.15]		0.60 [0.32,1.12]		0.97 [0.62,1.53]
Other		0.88 [0.60,1.29]		0.94 [0.55,1.61]		0.54 [0.32,0.92]		0.93 [0.55,1.57]		1.48 [0.66,3.31]		1.29 [0.75,2.21]		0.75 [0.51,1.10]

Table 5. *Continued*

Odds ratio [95% CI] associated with outcome:

Predictor/ covariate	Probable MH disorders (GHQ-12 ≥4) N=980		Probable anxiety (GAD-7 ≥10) N=722		Probable depression (PHQ-9 ≥10) N=713		Probable burnout (BAT ≥2.59) N=694		Probable alcohol misuse (AUDIT ≥8) N=710		Probable PTSD (PCL-6 ≥14) N=717		Used any staff support N=1,033	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Agenda for Change pay rate														
Bands 1-3 (R)		1		1		1		1		1		1		1
Bands 4-6		**2.42 [1.20,4.88]**		2.30 [0.86,6.19]		2.98 [1.10,8.07]		2.24 [0.82,6.09]		1.40 [0.29,6.81]		**4.18 [1.44,12.14]**		**2.66 [1.29,5.48]**
Bands 7-9		**2.25 [1.13,4.48]**		1.70 [0.63,4.58]		1.93 [0.71,5.19]		2.50 [0.92,6.79]		2.28 [0.49,10.7]		**2.99 [1.03,8.68]**		**2.38 [1.16,4.87]**
Don't know or prefer not to say		1.06 [0.53,2.13]		1.48 [0.53,4.11]		1.55 [0.55,4.31]		1.04 [0.37,2.94]		1.62 [0.32,8.13]		1.86 [0.61,5.68]		0.95 [0.45,2.01]
Not applicable		1.35 [0.67,2.73]		1.40 [0.50,3.91]		1.30 [0.46,3.64]		1.92 [0.69,5.38]		0.73 [0.14,3.87]		1.48 [0.48,4.52]		0.92 [0.43,1.96]
Been in contact with people with suspected COVID symptoms at work														
No (R)	1	1	1	1	1	1	1	**1**	1	1	1	1	1	1
Unsure	1.14 [0.74,1.76]	1.23 [0.75,2.00]	1.04 [0.57,1.89]	0.90 [0.47,1.73]	1.32 [0.74,2.38]	1.18 [0.62,2.26]	**2.40 [1.34,4.28]**	**2.38 [1.25,4.53]**	0.83 [0.31,2.22]	0.86 [0.30,2.45]	0.90 [0.48,1.69]	0.78 [0.39,1.57]	**0.57 [0.34,0.94]**	0.57 [0.33,0.98]
Yes	**1.74 [1.29,2.34]**	1.22 [0.84,1.75]	1.2 [0.8,1.79]	0.78 [0.49,1.27]	**1.73 [1.16,2.58]**	1.15 [0.72,1.85]	**2.04 [1.34,3.1]**	1.24 [0.75,2.03]	1.49 [0.82,2.71]	1.24 [0.63,2.44]	**1.58 [1.06,2.36]**	0.98 [0.60,1.60]	1.26 [0.92,1.72]	1.21 [0.84,1.74]
Works in acute care setting														
No (R)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Yes	**2.53 [1.96,3.27]**	**1.50 [1.08,2.07]**	**1.97 [1.40,2.77]**	1.41 [0.93,2.14]	**1.95 [1.41,2.69]**	1.28 [0.85,1.92]	**1.85 [1.34,2.56]**	1.23 [0.81,1.88]	1.51 [0.94,2.44]	0.93 [0.51,1.71]	**2.57 [1.84,3.60]**	**1.57 [1.03,2.41]**	**1.62 [1.25,2.11]**	1.04 [0.75,1.43]
Main role														
Non-clinical (R)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Clinical	**1.68 [1.31,2.17]**	1.33 [0.96,1.84]	1.31 [0.93,1.83]	1.07 [0.69,1.66]	**1.58 [1.14,2.2]**	1.22 [0.8,1.86]	**1.64 [1.18,2.28]**	1.20 [0.78,1.85]	1.17 [0.73,1.90]	0.96 [0.53,1.72]	**1.96 [1.40,2.75]**	**1.60 [1.02,2.51]**	1.30 [0.99,1.69]	1.07 [0.77,1.48]

Table 5. *Continued*

Odds ratio [95% CI] associated with outcome:

Predictor/ covariate	Probable MH disorders (GHQ-12 ≥4) N=980		Probable anxiety (GAD-7 ≥10) N=722		Probable depression (PHQ-9 ≥10) N=713		Probable burnout (BAT ≥2.59) N=694		Probable alcohol misuse (AUDIT ≥8) N=710		Probable PTSD (PCL-6 ≥14) N=717		Used any staff support N=1,033	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Length of time with current employer														
<1 year (R)		1		1		1		1		1		1		1
1-5 years		1.25 [0.81,1.93]		0.92 [0.54,1.56]		1.42 [0.82,2.44]		1.21 [0.7,2.09]		2.21 [0.86,5.65]		0.60 [0.35,1.03]		**1.96 [1.27,3.04]**
6-10 years		1.41 [0.82,2.45]		1.32 [0.68,2.57]		1.70 [0.88,3.32]		1.15 [0.58,2.3]		1.32 [0.43,4.13]		0.75 [0.38,1.49]		1.14 [0.65,2.01]
11-19 years		0.89 [0.50,1.58]		0.82 [0.39,1.74]		0.92 [0.44,1.95]		1.41 [0.68,2.94]		2.17 [0.70,6.72]		0.52 [0.24,1.13]		1.25 [0.70,2.24]
≥20 years		1.24 [0.67,2.29]		0.66 [0.30,1.47]		0.95 [0.44,2.05]		0.91 [0.41,2.02]		2.23 [0.69,7.17]		0.74 [0.34,1.60]		1.18 [0.63,2.20]
Social disconnection score (composite)														
<5 (R)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5-9	**2.82 [2.07,3.83]**	**2.20 [1.55,3.13]**	**1.77 [1.21,2.57]**	1.39 [0.91,2.13]	**2.08 [1.44,3.00]**	**1.68 [1.12,2.52]**	**2.30 [1.59,3.32]**	**1.66 [1.09,2.53]**	1.09 [0.66,1.80]	0.99 [0.56,1.76]	**2.62 [1.78,3.84]**	**2.10 [1.35,3.26]**	**1.50 [1.09,2.08]**	**1.44 [1.01,2.07]**
10-15	**21.5 [7.6,61.1]**	**18.3 [5.40,62.3]**	**5.35 [2.84,10.1]**	**4.18 [2.03,8.60]**	**8.20 [4.25,15.8]**	**6.25 [2.99,13.1]**	**6.00 [3.14,11.4]**	**3.82 [1.81,8.05]**	1.21 [0.47,3.10]	0.93 [0.33,2.68]	**9.97 [5.10,19.49]**	**7.10 [3.28,15.4]**	**2.04 [1.15,3.61]**	1.65 [0.87,3.12]
(Missing or incomplete)	1.24 [0.87,1.77]	1.05 [0.62,1.77]	0.57 [0.07,4.66]	0.57 [0.06,5.04]	1.21 [0.24,5.98]	1.01 [0.19,5.30]	1.38 [0.27,7.03]	1.34 [0.24,7.45]	1.11 [0.13,9.22]	1.04 [0.10,10.8]	0.76 [0.09,6.30]	0.73 [0.08,6.64]	1.19 [0.82,1.74]	1.53 [0.89,2.62]
Quality of care provision score (composite)														
<4 (R)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4-8	**3.57 [2.52,5.04]**	**3.04 [2.06,4.48]**	**2.04 [1.34,3.10]**	**1.85 [1.18,2.91]**	**1.90 [1.29,2.79]**	**1.56 [1.02,2.38]**	**3.99 [2.66,6.00]**	**3.76 [2.42,5.85]**	1.56 [0.92,2.65]	1.46 [0.81,2.62]	**2.06 [1.38,3.06]**	**1.69 [1.08,2.66]**	1.13 [0.8,1.59]	0.96 [0.66,1.42]
9-12	**9.73 [4.82,19.7]**	**7.20 [3.41,15.2]**	**7.00 [4.00,12.2]**	**6.39 [3.46,11.8]**	**4.93 [2.85,8.54]**	**3.89 [2.12,7.13]**	**9.68 [5.41,17.3]**	**8.12 [4.29,15.4]**	1.06 [0.45,2.53]	0.81 [0.32,2.05]	**6.24 [3.58,10.9]**	**5.31 [2.79,10.1]**	1.34 [0.8,2.27]	0.96 [0.53,1.73]
(Missing or incomplete)	***1.63 [1.2,2.22]***	**2.50 [1.56,4.01]**	**2.21 [1.36,3.59]**	**2.10 [1.21,3.67]**	1.52 [0.95,2.43]	1.39 [0.81,2.40]	**2.38 [1.46,3.90]**	**2.37 [1.35,4.17]**	0.76 [0.35,1.64]	0.56 [0.23,1.37]	**1.75 [1.08,2.84]**	1.74 [0.98,3.11]	1.01 [0.74,1.39]	0.98 [0.61,1.57]

NOTES: **Bold**: $p < 0.05$, *Italic*: $p < 0.01$, Underlined: $p < 0.001$.
†Category omitted as it perfectly predicts outcome. (R) Reference category.

Table 6. Summary characteristics according to amount of survey completed.

Variable	Short survey only (n=159) (15%)	Began long survey (n=378) (35%)	Finished long survey (n=528) (50%)
Age			
<20	1%	<1%	1%
20-29	18%	14%	18%
30-39	27%	21%	27%
40-49	22%	25%	22%
50-59	21%	26%	23%
≥60	10%	14%	9%
Mean [95% CI]	42.3 [40.4, 44.3]	44.6 [43.4, 45.9]	42.3 [41.3, 43.4]
Gender			
Female	65%	79%	76%
Male	34%	20%	23%
Other/Prefer not to say	1%	1%	1%
Relationship status			
Single	22%	24%	26%
In a relationship/cohabiting/married	73%	68%	67%
Divorced/separated/widowed	5%	7%	7%
Ethnicity			
Asian (includes Arab)	42%	27%	24%
Black	8%	6%	3%
White	41%	63%	66%
Mixed/Other	9%	5%	6%
Main role			
Non-clinical	53%	55%	35%
Clinical	47%	45%	65%
Agenda for Change pay rate			
Bands 1-3	4%	7%	5%
Bands 4-6	8%	26%	21%
Bands 7-9	15%	30%	26%
Not applicable	35%	16%	27%
Don't know or prefer not to say	37%	21%	21%
Length of time at current employer			
<1 year	20%	13%	16%
1-5 years	41%	43%	43%
6-10 years	10%	14%	15%
11-19 years	14%	16%	13%
≥60 years	15%	14%	13%
GHQ-12 score			
≥4 (probable MH disorder indicated)	36%	61%	54%
<4	64%	39%	46%
Mean [95% CI]	3.12 [2.58, 3.66]	5.24 [4.83, 5.65]	4.88 [4.55, 5.21]

Note: Figures are the proportion in each category, or the mean and its 95% confidence interval where indicated.

Nearly a third (n=328) of respondents reported using some kind of staff support service. Of these, 61.0% (n=200) used wellbeing services, 38.7% (n=127) used relaxation/timeout areas, and only 22.0% (n=72) used employee assistance programmes.

Regression analyses for variable associations with MH outcomes

A logistic regression model was fitted for each binary indicator of probable mental health disorder (as measured by GHQ-12, GAD-7, PHQ-9, BAT, AUDIT and PCL-6), and also an indicator for having used any staff support measures. For each of these outcomes, the covariates and their associated odds ratios and confidence intervals are shown in Table 5.

Older staff were less likely to have anxiety (Odds Ratio [OR] for 1-year increase in age: 0.98 [0.96,1.00]), or burnout (OR for 1-year increase in age: 0.98 [0.96,0.99]) than younger staff. Male staff were significantly less likely to access staff support programmes (OR 0.61 [0.43,0.88]) than females. Minority ethnic staff were significantly less likely to misuse alcohol (OR 0.19 [0.08,0.45]).

Staff in pay bands 4-6 (for example, ward nurses) were significantly more likely to have common mental health disorders (OR 2.42 [1.20,4.88]) and PTSD symptoms (OR 4.18 [1.44,12.14]) than lower banded staff, and were also more likely to access staff support (OR 2.66 [1.29,5.48]) than lower banded staff. The same outcomes were also significantly associated with bands 7-9 (senior clinical and managerial), albeit with marginally lower odds ratios.

Staff working in acute care settings were more likely to experience common mental health problems (OR 1.50 [1.08,2.07]) and PTSD (OR 1.57 [1.03,2.41]) than those in non-acute settings (e.g., community/primary care). Those with direct clinical facing duties had higher odds of PTSD symptoms than those in non-clinical roles (OR 1.60 [1.02,3.51]).

Social connectedness and perceived delivery of poor-quality care were highly associated with risk of all mental health problems apart from alcohol misuse (OR ranging from 1.56–18.34).

Discussion
Key results
Psychosocial impact

The prevalence of mental health morbidity in this study was high. A possible reason for this is the self-selecting, rather than probabilistic nature of the sample. Staff with existing mental health issues arising from the pandemic may be more likely to be attracted to the survey's subject matter, thereby inflating the prevalence of mental ill-health findings. Nonetheless, the finding that nearly 55% of staff could probably be diagnosed with a mental disorder, and that over 25% could be diagnosed with anxiety and depression, is comparable to other studies. The *NHS Check* study reported a similar rate of probable mental disorders from the first pandemic wave (Lamb *et al.*, 2021), while a study on intensive care unit (ICU) staff reported 45% met the threshold for a clinically significant mental disorder (Greenberg *et al.*, 2021). Ike et al's (2021) study of clinical staff in a tertiary London hospital reported higher rates of both anxiety (41.1%) and depression (42.7%). This difference could be accounted for by the inclusion of both clinical and non-clinical staff in the study, or the different period of the pandemic in which the data were collected.

Interestingly, unlike previous studies on the mental health impact of the pandemic (Lamb *et al.*, 2021; Ike *et al.*, 2021; Cipolotti *et al.*, 2021) our study did not find female sex to be associated with increased mental problems. Particularly concerning is the proportion of respondents (nearly 30%) reporting suicidal thoughts, the one in ten reporting suicidal ideation in the last two months, and the ten staff members reporting having tried taking their life in the previous two months. This rate lies between the figures reported by Lamb *et al.* (2021) (8.5% in the last 2 months) and by Greenberg *et al.* (2021), who reported a rate of 13% among ICU staff over the last two weeks, with a higher rate among nurses compared to doctors or other clinical staff. Similarly, self-harm, with no suicidal intent, was found among 11.5% of respondents, but less common (2.5%) over the last two months.

Of less concern—in the absence of baseline data as to 'typical' staff levels of alcohol consumption—is the fact that the vast majority of respondents (82.9%) reported alcohol consumption levels that were either the same or less than usual. This could be accounted for by restricted opportunities for social drinking (in the company of others in a public setting), especially during lockdown periods. It might also be affected by social desirability bias and the fact that the sample had a high proportion of people from ethnic minority backgrounds (39%), in whom we found very low likelihood of alcohol misuse. The proportion of participants reporting drinking more frequently is lower than that in the general population in the UK, among whom 30% reported an increased frequency of drinking (Oldham *et al.*, 2021). Nonetheless, overall,

10.6% of the sample met the threshold for probable alcohol misuse. This is consistent with findings from the *NHS Check* study, which reported a rate of 10.5% (Lamb *et al.*, 2021), and lower than the rates of problem drinking among UK adults overall. According to one study, 23% of UK adults reported drinking ≥ 4 times a week, and 16.6% reported heavy episodic drinking at least once weekly during the COVID-19 lockdown in April 2020 (Daly and Robinson, 2020).

We created novel composite scores for social disconnection and self-perception of poor-quality care provision which were very strongly associated with most of the validated mental health outcomes. This is consistent with Cipolotti *et al's* (2021) finding that social change concerns, which include distancing from family and friends, is predictive of psychological distress among HCWs. Missing or incomplete responses to the quality-of-care questions were also very strongly associated with poor mental health, possibly suggesting reluctance to provide responses criticising care provision. These findings are important for those assessing staff at risk of, or currently experiencing, problems with mental wellbeing, as both are potentially modifiable. For example, employers should consider screening for social support and job satisfaction, and signpost staff to community social prescribing interventions or offering such interventions within employing organisations for staff with low social support. The importance of feeling that the care staff offer is high quality is intriguing. It is unclear from our study whether this reflects a generic sense of purpose among health care staff that is an important determinant of wellbeing, or whether there has been a direct causal effect of COVID-19 on perception of quality care.

Occupational impact
We found strong evidence that younger staff were more anxious than their older colleagues. While the association between adverse outcomes and younger age was also found in Lamb *et al's* study (2021), age was not found to have a significant effect on psychological distress scores in Cipolotti *et al's* (2021) study of neuroscience HCWs in the UK.

Salary pay-scale bands 4-6 tended to have the worst mental health outcomes and to use support most often, although bands 7-9 are not far behind in both respects. This is in contrast to those on bands 1-3, who had the best outcomes and were least likely to use support. This is consistent with previous research indicating that nurses (who are generally in bands 4-6) are more likely to meet clinical thresholds for depression, PTSD, and anxiety (Lamb *et al.*, 2021; Greenberg *et al.*, 2021; Ike *et al.*, 2021), and that staff with higher levels of control and authority may be less impacted. Most concerning is that nearly one third of respondents had probable burnout, and almost as many reported probable PTSD. The long-term consequences of burnout and fatigue are significant, particularly if they become chronic. The factors contributing to burnout appear to be modifiable, however, and include working in a COVID-19 role, having access to PPE and the ability to rest and recover during breaks (Gemine *et al.*, 2021). Working in acute care, or in a clinical role, was associated with an elevated risk of PTSD, while acute care settings were associated with common mental health disorders.

Need for supportive mental health interventions
Existing research indicates NHS staff consider psychological support and clear updates as the most useful forms of support for protecting their mental health (Cipolotti *et al.*, 2021; Cubitt *et al.*, 2021). Crucially, the types of support endorsed by staff seem to vary based on age, professional role, and exposure to COVID-19 patients (Cipolotti *et al.*, 2021). A number of organisations have called for better mental health and wellbeing support for health and social care staff following the COVID-19 pandemic (Health and Social Care Committee, 2021). However, there appears to be discordance between guidelines and staff perspectives of what the focus of support interventions should be, as the recommended interventions do not always address staff lived experiences (San Juan *et al.*, 2020). It is therefore important to examine the impact and effectiveness of the interventions being offered by organisations.

Limitations
A number of limitations should be acknowledged. First, the sample may not fully represent the NHS workforce. Despite a comprehensive and inclusive recruitment strategy across all health care provider organisations in NWL and adoption by the Clinical Research Network, giving the many thousands of potential recruits, at just over one thousand the number of responses was disappointing. This can be explained by multiple factors, including: a surfeit of concurrent staff surveys—research, audit, routine annual surveys (e.g., the national NHS Pulse survey (https://www.england.nhs.uk/nhs-people-pulse/)—that contributed to 'survey fatigue'; occupational burnout among staff members striving to combat the impact of COVID-19 upon those they cared for; and a benign paternalism among protective senior management anxious not to further 'burden' staff by asking about their wellbeing.

Second, the study sample was self-selecting rather than probabilistic. This could either over- or under-represent the prevalence of the studied psychosocial, occupational and support programme domains. However, most levels of key socio-demographic variables were well represented, and the overall data distribution appears broadly in alignment with expectations for the target population.

Third, there were some differences between those completing the short and long surveys (see Table 6). Respondents choosing to withdraw after the short survey were more likely to be male, from an ethnic minority background, be born overseas, and have a more favourable GHQ-12 score. Those continuing to engage with the survey to its end were also more likely to be in a clinical role. Additionally, since most outcomes—other than the GHQ-12—are only measured in the long survey, this may further affect the generalisability of those results. However, it is important to note that given we cannot observe the earlier self-selection determining who is in the sample to begin with, there is no guarantee it operates in the same direction; i.e., it is possible those who completed the long-survey could actually be more representative of the population as a whole than the short-survey respondents.

Fourth, given the number of potential associations being investigated, it is highly likely that some of the significant findings (especially significance codes * and **) are false positives (Fisher, 1971). However, some variables, particularly pay band, perception of care quality and social disconnection, were associated with more than one mental health outcome and showed evidence of a consistent trend across categories, suggesting that these findings are especially credible.

Lastly, our study does not have any pre-pandemic comparative mental health data for NHS staff or for non-NHS staff during the pandemic with which to further contextualise the impact of COVID-19 on our study population.

Interpretation
This study found ongoing evidence of significant psychosocial morbidity and adverse occupational impacts upon NHS staff members from the second wave of the COVID-19 pandemic that echoes that reported from the first wave, identified staff groups at risk factors and suggests areas for potential intervention.

Research is needed to explore how this group's psychological burden changes, if at all, over time, and if that change is attributable to factors around personal resilience or preferred and effective local and/or national mental health support interventions and resources. It is only through such insights that effective preventive measures and reactive interventions can be designed that are tailored to the needs of HCW groups.

Generalisability
The sample was a large, ethnically diverse group of NHS staff from across the workforce, in clinical and non-clinical roles, working in acute and community settings and from low grade to senior roles. The proportion of respondents completing the full survey once they had enrolled was high. The protocol was subject to extensive peer review and measured a range of mental disorders, not just common mental health problems of anxiety and depression. The majority of data collection took place during the second wave lockdown, when rates of infection and death were particularly high (winter 2020/21). It is likely therefore to reflect the worst of the pandemic in terms of mental health impact. The self-selecting nature of our sample may mean that those with a high mental health burden are either under- or over-represented. However, our findings echo many hypotheses from the literature, add novel findings and have important workforce implications.

Authors' contributions
DN proposed and designed the study. RAP, VMLB, JN and SJ made contributions to the design of the work. RAP, VMLB and JJ helped acquire the data. EW performed the data analysis, with all authors contributing to its interpretation. RAP prepared the first draft of the manuscript, with substantial contributions from EW and JJ. All authors approved the final version of the manuscript.

Data availability
Underlying data
Zenodo: MeCareNWL – baseline data concerning the psychosocial and occupational impact of COVID-19 among NHS and social care staff in NW London, https://doi.org/10.5281/zenodo.8112940 (Powell *et al.*, 2022).

The project contains the following underlying data:

- Baseline MeCare data anonymised full.csv (anonymised data extracted from the study database).

Extended data
Zenodo: MeCareNWL – baseline data concerning the psychosocial and occupational impact of COVID-19 among NHS and social care staff in NW London, https://doi.org/10.5281/zenodo.8112940 (Powell *et al.*, 2022).

This project contains the following extended data:

- Baseline_MeCare.pdf (questionnaire).

- STROBE-checklist-v4-cross-sectional MeCareNWL baseline_F1000_1 June 2023.doc (STROBE checklist for the article "A cross-sectional study of the psychosocial and occupational impact of COVID-19 among NHS staff: findings from a Northwest London cohort during the second wave").

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Acknowledgements

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