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Demographic, occupational factors and pandemic-related stressors associated with heightened mental health difficulties amongst UK health and social care workers supported by regional Resilience Hubs during the COVID-19 pandemic

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Complete List of Authors:	<p>Varese, Filippo; The University of Manchester, School of Health Sciences, Manchester Academic Health Science Centre; Greater Manchester Mental Health NHS Foundation Trust, Complex Trauma & Resilience Research Unit</p> <p>Allsopp, Kate; Greater Manchester Mental Health NHS Foundation Trust, Research & Innovation; The University of Manchester Division of Psychology and Mental Health, Division of Psychology and Mental Health</p> <p>Carter, Lesley-Anne; The University of Manchester, Centre for Biostatistics, Division of Population Health, Health Services Research and Primary Care</p> <p>Wilkinson, Jack; University of Manchester, Centre for Biostatistics; Salford Royal NHS Foundation Trust, Research and Development</p> <p>Shields, Gemma; University of Manchester, Centre for Health Economics</p> <p>Rowlandson, Aleix; The University of Manchester, Centre for Health Economics</p> <p>Chung, Priscilla; Lancashire and South Cumbria NHS Foundation Trust, Lancashire and South Cumbria Resilience Hub</p> <p>Hassan, Alysha; Mersey Care NHS Foundation Trust, Cheshire & Merseyside Resilience Hub</p> <p>White, Hannah; Greater Manchester Mental Health NHS Foundation Trust, Research and Innovation</p> <p>Wright, Sally-Anne; Lancashire and South Cumbria NHS Foundation Trust, Lancashire and South Cumbria Resilience Hub</p> <p>Young, Ellie; Pennine Care NHS Foundation Trust, Greater Manchester Resilience Hub</p> <p>Davey, Jess; Tees Esk and Wear Valleys NHS Foundation Trust, Humber & North Yorkshire Resilience Hub</p> <p>Barrett, Alan; Pennine Care NHS Foundation Trust, Greater Manchester Resilience Hub; University of Salford, School of Health & Society</p> <p>Bhutani, Gita; Lancashire and South Cumbria NHS Foundation Trust, Lancashire & South Cumbria Resilience Hub; Greater Manchester Mental Health NHS Foundation Trust, Complex Trauma & Resilience Research Unit</p> <p>Hind, Daniel; The University of Sheffield, SCHARR</p> <p>McGuirk, Katherine; NHS Greater Manchester Health and Social Care Partnership</p> <p>Huntley, Fay; University of Edinburgh, Doctorate of Clinical Psychology</p>



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Demographic, occupational factors and pandemic-related stressors associated with heightened mental health difficulties amongst UK health and social care workers supported by regional Resilience Hubs during the COVID-19 pandemic

Filippo Varese,^{1,2} Kate Allsopp,^{2,1} Lesley-Anne Carter,¹ Jack Wilkinson,¹ Gemma Shields,¹ Aleix Rowlandson,¹ Priscilla Chung,³ Alysha Hassan,⁴ Hannah White,² Sally-Anne Wright,³ Ellie Young,⁵ Jess Davey,⁶ Alan Barrett,^{5,7} Gita Bhutani,^{3,8} Dan Hind,⁹ Katherine McGuirk,^{5,10} Fay Huntley,⁴ May Sarsam,⁴ Holly Walker,⁶ Joanne Jordan,⁶ Hein Ten Cate,³ Ruth Watson,^{2,5} Jenni Willbourn,⁵ Paul French,^{11,12}

¹ University of Manchester, School of Health Sciences, Faculty of Biology, Medicine and Health, Manchester Academic Health Science Centre, Oxford Road, Manchester M13 9PL

² Greater Manchester Mental Health NHS Foundation Trust, Manchester Academic Health Science Centre, Research and Innovation, 3rd Floor Rawnsley Building, Hathersage Road, Manchester M13 9WL

³ Lancashire and South Cumbria Resilience Hub, Lancashire and South Cumbria NHS Foundation Trust, Sceptre Point, Sceptre Way, Walton Summit, Preston, PR5 6AW

⁴ Cheshire and Merseyside Resilience Hub, Mersey Care NHS Foundation Trust, V7 Building, Kings Business Park, Prescot, L34 1PJ

⁵ Greater Manchester Resilience Hub, Pennine Care NHS Foundation Trust, Trust Headquarters, 225 Old Street, Ashton-under-Lyne, Lancashire OL6 7SR

⁶ Humber & North Yorkshire Resilience Hub, Tees Esk and Wear Valleys NHS Foundation Trust, West Park Hospital, Edward Pease Way, Darlington DL2 2TS

⁷ University of Salford, School of Health & Society, Mary Seacole Building, Frederick Road Campus, Broad St, Salford, M6 6PU

⁸ University of Liverpool, School of Psychology, Ground floor, Whelan Building Quadrangle Brownlow Hill Liverpool L69 3GB

⁹ University of Sheffield, School of Health and Related Research, The Innovation Centre, 217 Portobello, Sheffield, S1 4DP

¹⁰ Greater Manchester Health and Social Care Partnership, 4th Floor, 3 Piccadilly Place, Manchester, M1 3BN

¹¹ Manchester Metropolitan University, Faculty of Health, Psychology and Social Care, Brooks Building, Bonsall Street, Manchester M15 6GX

¹² Pennine Care NHS Foundation Trust, Trust Headquarters, 225 Old Street, Ashton-under-Lyne, Lancashire OL6 7SR

Corresponding author: Professor Filippo Varese
(Filippo.Varese@manchester.ac.uk)

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Abstract

Background: During the COVID-19 pandemic, 40 Mental Health and Wellbeing Hubs were funded in England to support health and social care staff affected by the pandemic.

Aims: To describe the characteristics of staff accessing four Hubs for support, and identify characteristics associated with clinically significant mental health difficulties and work and social functioning.

Method: Routinely collected screening data were analysed from 1973 individuals across four Hubs, including mental health, demographic and occupational data, and pandemic-related stressors. Factors associated with clinically significant mental health difficulties were identified via logistic regression.

Results: Most Hub clients identified as white women who worked for the UK National Health Service; other groups were less well represented. Hub clients reported high levels of clinically significant mental health difficulties: 60% had severe and often co-occurring difficulties (i.e. depression, anxiety, PTSD or alcohol use) and 80% reported significantly impaired functioning. Younger age, disability status, identifying as from a minority ethnic group, and sexual orientations excluding heterosexual were associated with higher likelihood of having clinically significant mental health difficulties. Suffering financial loss during the pandemic, and pre-pandemic emotional wellbeing concerns were the most consistent factors associated with higher difficulties.

Conclusions: The Hubs supported health and social care staff with significant mental health difficulties. Outreach and engagement with under-represented groups should be undertaken to address potential barriers to service access. The findings add to the knowledge-base on the support needs of the health and social care workforce and the planning of support in response to future crises.

Study registration: researchregistry6303

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Strengths and limitations of this study

- This is the first study exploring the characteristics of health and social care staff registering for support with staff wellbeing hubs ('Resilience Hubs') funded by NHS England during the COVID-19 pandemic, and which of these characteristics were associated with more severe mental health difficulties.
- The study has a large sample size of 1973 individuals who gave consent for use of their data for research purposes, across four Resilience Hubs, representing 83% of the staff who referred themselves to the Hubs between 1st June 2020 and 31st December 2021.
- The study is limited by the lack of a comparison group, for example, staff who accessed alternative support services in a region without Hub support available.
- Finally, the current study explores 10% of the 40 Hubs set up during the pandemic. NHS England guidance for the setup of staff wellbeing hubs was broad, and has been operationalised with high levels of local variation across Hubs, therefore these findings may not be representative of all staff wellbeing hubs.

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Introduction

The COVID-19 pandemic has affected the mental health of health and social care staff.^{1,2} Systematic reviews have demonstrated high levels of depression, anxiety and post-traumatic stress symptoms throughout the pandemic.^{3,4} Pooled prevalence from one review suggested that globally, 49% of healthcare staff reported problems with insomnia, 47% anxiety, and 37% with post-traumatic stress.⁵ Research suggests that the mental health of staff from Black, Asian, and minority ethnic communities may have been particularly affected.⁶ Staff working in intensive care units (ICU) or critical care services are more likely to have experienced post-traumatic stress and other mental health difficulties.⁷ Whilst there is limited research on the mental health of care home staff, the impact appears no less severe.⁸

NHS England, the commissioning body that oversees the National Health Service (NHS) in England, funded 40 resilience or wellbeing hubs to support staff during the pandemic.⁹ These Hubs were modelled on the Greater Manchester Resilience Hub, initially set up in response to the Manchester Arena bombing, offering a range of services to support health and social care staff who have been affected by the pandemic. Their aim was to expedite access to evidence-based mental health support that might have been otherwise be more challenging to access by health and social care professionals due to known barriers to help-seeking and the additional strain placed on services by the pandemic.¹⁰ Support offered by the Hubs is consistent with NICE guidance on mental wellbeing at work.¹¹ Information on the clinical needs and characteristics of clients who accessed the Hubs during the pandemic can clarify the utility of this model of support in terms of meeting staff needs that may be too complex or severe for conventional occupational health support provided by health and social care employers, especially during large-scale crises. This quantitative study is part of a wider mixed methods evaluation that was funded by the UK's National Institute of Health and Social Care Research (NIHR) to maximise learning from the UK's response to the early phases of the COVID-19 pandemic in relation to the implementation of this innovative system of support for responding to increased mental health needs populations and specific groups affected large scale crises. ¹² Findings pertaining to other workstreams of the 'Resilience Hubs Evaluation' are reported elsewhere.¹³ In this report, we outline findings pertaining to the demographic and occupational characteristics of staff

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accessing the Hubs for support (i.e. 'Hub clients'), and identify staff characteristics that associated with greater likelihood of mental health and functional difficulties that may benefit from mental health support in order to better inform the case for future similar support services should their activation be required in response to novel crises and/or ongoing staff mental health support initiatives.

Method

Ethical approval

Ethical approval was granted for this study through North West – Preston Research Ethics Committee IRAS Project ID 290375 REC Reference 20/NW/0462.

Setting

Four Hubs were involved in the study. Hub names have been anonymised and are described below as Sites A-D.

Participants

1973 Hub clients were included in the analyses. Hub clients were defined as staff members eligible for Hub support who had been referred or self-referred for individual support from one of four Resilience Hubs in the North West of England. All participants 1) were over 18 years of age, 2) completed screening at one of the Hubs between 1st June 2020 and 31st December 2021 and 3) consented for their data to be used for research purposes.

The Hubs became operational at different timepoints due to variation in setup times, and most of the Hubs involved in the study opened in stages to different staffing groups. The earliest Hub to open was Site D in May 2020. The other Hubs became operational between November 2020 and February 2021.

Measures

Mental health screening formed a part of the self-referral process at all Hubs involved in the evaluation, although there were some variations across services. All Hubs encouraged online self-referral, and the completion of mental health screening data was either conducted as part of the online self-referral form, or, at one Hub,

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online questionnaires were sent to staff after their referral was accepted and prior to their first assessment session. All Hubs routinely collected data on symptoms of depression (using the *Patient Health Questionnaire*; PHQ-9¹⁴), anxiety (the *General Anxiety Disorder scale*; GAD-7¹⁵), and social and occupational functional impairment (the *Work and Social Adjustment Scale*; ¹⁶WSAS). The Hubs also administered screening tools for Post-Traumatic Stress Disorder, but different instruments were employed at the participating Hubs (Sites A and B used the *PTSD Checklist for the DSM-5*, PCL-5;¹⁷ Sites C and D used the *International Trauma Questionnaire*, ITQ¹⁸). Three Hubs (Sites A, C and D) also collected data on harmful alcohol use using the *Alcohol Use Disorders Identification Test* (AUDIT).¹⁹

Details on the scoring of the above instruments, including the scoring thresholds and criteria we used to examine the prevalence of clinically significant difficulties in the above domains (i.e. depression, anxiety, post-traumatic stress, problematic alcohol use and functioning) are summarised in Table 1.

[Insert Table 1 approximately here]

The Hubs also collected data on a range of Hub clients' characteristics relevant to the planned analyses, including 1) *demographic data* (age, gender, ethnicity, disability status and sexual orientation, 2) *occupational and work environment characteristics* (Hub clients' work setting and job role), 3) whether Hub clients had *concerns about their emotional wellbeing / mental health prior to the pandemic*, and 4) information on *common impacts of COVID during the acute phase of the pandemic*. The latter covered whether the person had been impacted by COVID-19 in any of the following ways: 1) seconded to a different post; 2) moved to work in a different location; 3) undertaking new tasks within usual role; 4) been ill with confirmed COVID-19 (recovered at home); 5) been ill with confirmed COVID-19 (including being in hospital); 6) family member been ill with confirmed COVID-19 (recovered at home); 7) family member been ill with confirmed COVID-19 (included being in hospital); 8) experienced family/close friend bereavement; 9) suffered financial loss within the household

Procedures

All individuals screened by the Hubs were routinely asked to provide consent for their anonymised data to be used for research purposes. Relevant data for all consenting Hub clients was extracted from the Hubs' electronic patient records systems, cleaned, and anonymised by research assistants (RAs) based at each Hub. The data was compiled onto a central database managed by the study statisticians, who performed quality checking and relevant re-coding/cleaning ahead of the planned analyses.

Analysis

For each Hub, we numerically summarised data on participant demographic and occupational characteristics, reported COVID-19 impacts and pre-pandemic emotional wellbeing concerns. Data from mental health screening questionnaires were summarised numerically as total scores and used to determine the number of participants meeting threshold for clinically significant difficulties across the assessed domains. A series of logistic regression models, adjusted for Hubs due to the multi-site nature of the data, were conducted to examine the association between each independent variable and 'caseness' on each mental health screening outcome variable. To evaluate whether these relationships varied across the Hubs, all models were refitted with an interaction between the variable under consideration and site. The interaction was assessed using a Likelihood Ratio Test for logistic regression models. To offer some protection against spurious findings arising from multiple testing, we used a significance threshold of $p < 0.001$ for interaction analyses to identify potential differences across Hubs. Owing to the large number of tests performed, p-values should be considered nominal; significant associations are best interpreted as exploratory. A final set of analyses was conducted using proportional odds ordinal logistic regression analyses, adjusted for site, to identify potential factors associated with higher 'overall severity' variable across the various standardised screening measures collected by the Hubs. This three-level categorical variable was defined by the highest severity categorisation received on any of Hubs screening questionnaires (further detail on the definition of this derived variable is available in full, see Supplementary Material).

Results

Due to different data collection policies at the participating Hubs (i.e. whether Hub clients were required to complete clinical screening measures at registration or not, and whether they were given the option of ‘skipping’ particular items or instruments), data availability varied according to site. For example, Hub B presented notably higher missing data on the mental health screening measures Hub clients were required to complete (i.e. approximately 11%) compared to other Hubs (where missing data was in most cases < 1%). Most of the other variables considered in our analyses, data missingness was < 3%, with the notable exclusion of certain demographic variables (in particular ethnicity and sexual orientation, which presented higher numbers of not stated and ‘prefer not to say’ answers at certain sites). As the above suggests that data were unlikely to be missing at random, only observed data were used in the descriptive and regression analyses reported below.

In terms of occupational background, most Hub clients were NHS employees. A sizable minority of these NHS employees (30% of all NHS participants) worked in intensive care settings. Only a relatively small proportion reported working in social care settings (6%) or in emergency services (5%; see Supplementary Table 2 for a more detailed breakdown of the occupational characteristics of the sample). The demographic characteristics the sample are displayed in *Table 2*.

[Insert Table 2 approximately here]

Overall, the demographic characteristics of Hub clients were similar across Hubs. The average age of clients was 41.1 years (SD = 11.2), ranging from 38.8 years to 42.3 years across Hubs. The available ethnicity data indicated that clients were predominantly of white British background (90% across Hubs). In terms of gender and sexual orientation, between 84% of Hub clients identified as women, and between 91.5% identified as straight/heterosexual. Self-reported information on disability status was more variable, ranging between 4% and 18% across Hubs. Of note, these differences may be artefactual and due to variances in how questions on disability status were framed at different Hubs.

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As summarised in Table 3, considerable proportions of participants experienced a range of adverse pandemic-related personal and occupational circumstances prior to completing the screening offer of the Hubs, and many clients reported having emotional wellbeing concerns that preceded the onset of the pandemic.

[Insert Table 3 approximately here]

Mental health and functional screening data

As illustrated in Table 4, a large proportion of Hub clients had been negatively affected by significant mental health and/or functional difficulties. The proportion of participants presenting PHQ-9 scores above the cut-off for moderate depression was 81%. In terms of anxiety, 60% of participants had GAD-7 scores above the cut-off for moderate anxiety. In Hubs that used the PCL-5, 59% of clients had scores suggestive of probable PTSD. Conversely, a lower observed prevalence of possible trauma-related disorders (PTSD and complex PTSD) was observed when the ITQ was used (34% at Site C and 28% at Site D). The proportion of participants presenting AUDIT scores above the cut-off for hazardous alcohol use was 23%. Most Hub clients presented WSAS scores above threshold for significant impairment in functioning (79%).

[Insert Table 4 approximately here]

In terms of overall severity, 60% of Hub clients scored in the most severe range of scores on at least one mental health screening measure (see Table 1 for categories of severity for each measure, e.g. severe depression or anxiety; moderately severe or worse functional impairment; or possible alcohol dependence). Only 10% of users presented scores in the lowest range of severity across all measures (e.g. no depression; minimal anxiety; subthreshold for PTSD etc). As illustrated in Figure 1, most participants had scores suggestive of multiple co-morbid difficulties, with 60% of the sample meeting caseness criteria on at least three different screening measures.

[Insert Figure 1 approximately here]

Factors associated with elevated mental health and functional difficulties

The results of the logistic regression analyses exploring factors associated with elevated mental health and functional difficulties amongst Hub clients are summarised below, and reported in full in Supplementary Tables 2-7.

The regression analyses to identify factors associated with higher likelihood of PHQ-9 caseness found that having a disability (OR = 1.71; 95%CI [1.19, 2.53], p = .005), a minority sexual orientation (i.e., participants identifying as any sexual orientation other than heterosexual; OR = 1.89, 95%CI [1.23, 2.94], p = .004), suffering a financial loss (OR = 1.48; 95%CI [1.14, 1.95], p = .004), and having pre-pandemic emotional wellbeing concerns (OR = 2.03; 95%CI [1.62, 2.53], p < .001) were associated with higher likelihood for caseness. Undertaking new work-related tasks was also associated with greater likelihood of caseness (OR = 1.23; 95%CI [1.01, 1.51], p = .038), with interaction analyses indicating more pronounced PHQ-9 caseness risk at Site D relatively to other Hubs (p < .001).

The GAD-7 analyses found evidence of decreased likelihood of caseness with older age (OR = 0.98; 95%CI [0.97, 0.99], p < .001). Suffering a financial loss (OR = 1.28; 95%CI [1.00, 1.64], p = .049), having had a bereavement (OR = 1.38; 95%CI [1.07, 1.77], p = .012), and reporting pre-pandemic emotional wellbeing concerns (OR = 2.05; 95%CI [1.66, 2.53], p < .001) were associated with higher likelihood for caseness.

In terms of PTSD, working in ICU/critical care and having a disability was associated with higher likelihood of having PCL-5 scores suggestive of probable diagnosis for PTSD (OR = 2.23; 95%CI [1.45, 3.52], p < .001). Undertaking new tasks (OR = 1.71; 95%CI [1.31, 2.25], p < .001), moving to a new work location (OR = 1.49; 95%CI [1.13, 1.95], p = .004) and suffering a bereavement (OR = 1.91; 95%CI [1.41, 2.58], p < .001) were associated with higher likelihood of PTSD caseness on the ITQ. In both the PCL-5 and ITQ analyses, pre-pandemic emotional wellbeing concerns (OR = 1.95; 95%CI [1.42, 2.70], p < .001 and OR = 1.59; 95%CI [1.20, 2.11], p = .001

respectively) and suffering a financial loss (OR = 1.72; 95%CI [1.12, 2.69], $p = .015$ and OR = 1.57; 95%CI [1.16, 2.13], $p = .003$ respectively) were associated with increased likelihood of probable PTSD.

The AUDIT caseness analyses indicated that identifying as a man (OR = 2.35; 95%CI [1.74, 3.16], $p < .001$) and undertaking new tasks (OR = 1.38; 95%CI [1.09, 1.76], $p = .008$) were associated with increased risk for problematic alcohol use. Conversely, identifying as an ethnic minority (OR = 0.24; 95%CI [0.09, 0.51], $p = .001$), having a disability (OR = 0.65; 95%CI [0.41, 0.98], $p = .049$), having experienced a hospitalisation because of COVID (OR = 0.20; 95%CI [0.05, 0.54], $p = .006$) and moving to a new work location (OR = 0.71; 95%CI [0.55, 0.93], $p = .001$) were associated with lower risk for problematic alcohol use.

The analyses to identify factors associated with significant impairments in functioning found that identifying as any sexual orientation other than heterosexual (OR = 2.44; 95%CI [1.45, 4.35], $p = .002$), having a disability (OR = 1.93; 95%CI [1.23, 3.15], $p = .006$), having a family member recovering from COVID at home (OR = 1.62; 95%CI [1.24, 2.14], $p = .001$), suffering a financial loss (OR = 1.59; 95%CI [1.17, 2.19], $p = .004$), and pre-pandemic emotional wellbeing concerns (OR = 2.29; 95%CI [1.77, 2.97], $p < .001$) were associated with a higher likelihood of presenting with WSAS scores indicative of significant impairment in functioning.

The results of the proportional odds ordinal logistic regression analyses to identify factors associated with greater overall severity across the various mental health screening measures used by the Hubs are displayed in *Supplementary Table 8*. In these analyses, ORs relate to the odds of being in a higher severity category (moderate, high) in presence of the putative risk factor (or, for age, for each one-year increase).

Age was negatively associated with severity rating, such that people with higher age tended to have lower overall severity ratings (OR = 0.99; 95%CI [0.98, 1.00], $p = .05$). Identifying as any sexual orientation other than heterosexual was associated with higher rating (OR = 1.75; 95%CI [1.22, 2.63], $p = .004$). Presence of a disability (OR = 1.70; 95%CI [1.21, 2.41], $p = .003$), a family member having COVID-19 and

recovering at home (OR = 1.31; 95%CI [1.06, 1.63], p = .01), suffering financial loss (OR = 1.84; 95%CI [1.43, 2.39], p < .001), and pre-pandemic emotional wellbeing concerns (OR = 2.11; 95%CI [1.72, 2.59], p < .001) were associated with higher ratings. We did not find evidence that associations varied across Hubs

Discussion

This study represents the first multi-site evaluation of the demographic and occupational characteristics of clients who accessed Resilience Hub services dedicated to supporting the mental health needs of health and social care workers during the COVID-19 pandemic. The severity of, and factors associated with, common mental health difficulties amongst these help-seeking, high-risk occupational groups were explored to inform ongoing and future strategies for supporting the health and social care workforce.

The findings indicated that most Hub clients who completed the Hub screening offer worked in NHS healthcare settings, with considerably smaller proportions of respondents working for other in-scope sectors. Hub clients included in these analyses predominantly identified as women and from a white background. These figures are in contrast with workforce demographics across health and social care sector, whereby men typically make up 18% and 24% of the workforce for social care and the NHS respectively.^{20,21} People identifying as from a Black, Asian, or minority ethnic background typically make up 23% and 30% of the workforce for social care and the NHS respectively.^{20,21} It is unlikely that the observed difference between the demographics of our sample and those of the broader NHS and social care workforce could be entirely attributable to self-selection for the present analyses (i.e., as participants consented for their anonymised data to be used for research purposes) or geographical variances. The findings are therefore suggestive that Hub clients may under-represent specific demographic and occupational groups, including individuals from Black, Asian and minority ethnic groups, men and staff from social care and emergency services. While some of these differences may be due to restrictions of support to certain groups as per evolving national guidance during the study, e.g. around inclusion of emergency service workers, as well as phased opening of offers that prioritised certain occupational groups, these findings highlight possible issues with the visibility and/or accessibility of Hub support for

certain in-scope occupational and demographic groups, which could be addressed as part of future initiatives to better target these under-represented groups.

Participants presented with considerable mental health needs across all domains assessed. The prevalence of mental health difficulties was broadly comparable across Hubs, but with slightly lower observed figures for Site D but also marked differences in PTSD caseness between Hubs that used different instruments to assess post-traumatic stress i.e., ITQ was associated with lower detected caseness relatively to PCL-5. Approximately 80% of Hub clients had scores suggestive of significant impairments in functioning. Furthermore, 60% of Hub clients scored in the most severe range of scores on at least one of the screening measures, whilst only 10% had subclinical scores across all measures. These figures are generally congruent with the findings of other research highlighting elevated mental health needs amongst health and social care staff during the COVID-19 pandemic as well as elevated pre-pandemic mental health risk in certain occupational groups (e.g., healthcare workers).²² Nonetheless, the observed prevalence of significant difficulties in this study is striking, and likely due to the help-seeking nature of this sample. These findings, alongside data indicating that a considerable proportion of Hub clients reported being concerned about their emotional wellbeing prior to the pandemic, suggest that the Hub clients presented with a degree of complexity, characterised by multiple co-occurring mental health difficulties which impacted functioning, as well as difficulties that may be long-lasting, i.e., they may have preceded (and potentially aggravated by) the COVID-19 pandemic. Whilst our analyses did not account for temporal trends, it is possible that levels of 'caseness' may have varied, and potentially increased, over the course of the pandemic. This would be consistent with the relatively lower prevalence of difficulties observed at that became fully operational in earlier phases of the pandemic (e.g., Site D).

Our analyses identified several characteristics associated with clinically significant mental health concerns in this sample. Older age was found to be associated with reduced risk for anxiety and overall severity of presentations. Participants who described their ethnic background as white were at higher risk for problematic alcohol use. Individuals who identified as men had elevated risk for alcohol-related problems. Hub clients who identified as any sexual orientation other than

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heterosexual were at elevated risk for depression, alcohol misuse, functional impairment, and higher overall severity. Having a disability was associated with increased risk for depression, post-traumatic stress, functional impairment, and higher overall severity, but also a reduced risk for alcohol-related problems compared to participants who did not report any disability on the screening questionnaires. These findings are consistent with those of prior studies focusing on the association between these individual characteristics and mental health difficulties in both specific staff groups eligible for Hub support (e.g., healthcare workers) and the general population.^{7,23–25}

While fine-grained analyses considering the relative risk of specific occupational characteristics were unviable (due to the heterogeneity in which this information was collected across sites), our analyses focusing on ICU/Critical care workers (a particular ‘high risk’ group due to their high level of disease exposure during the pandemic) found evidence suggestive of particularly elevated risk for post-traumatic stress. This finding is consistent with recent UK research reporting high levels of probable PTSD and other mental health difficulties in this group.⁷ Other occupational variables potentially associated with higher risk included specific stressful circumstances experienced during the pandemic. While being seconded or redeployed into different work roles was not associated with increased risk, moving to a new work location (a closely related variable) was associated with increased risk for PTSD, whereas undertaking new tasks was associated with increased risk for depression, post-traumatic stress, and problematic alcohol use.

In line with findings from other research, other stressful life circumstances experienced during the pandemic also had an impact on the mental health difficulties reported by the present sample.^{4,26} Suffering a financial loss during the pandemic was (together with having pre-pandemic emotional wellbeing concerns) the most consistent variable associated with higher likelihood for caseness across all the domains assessed by the Hub screening measures. Having recovered from severe COVID illness which involved hospitalisation and/or having a family member undergoing a similar adverse experience was associated with increased risk for post-traumatic stress. Conversely, having family members who recovered at home from COVID was associated with higher anxiety risk as well as greater functional

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impairment. Suffering a bereavement was associated with increased risk for anxiety and post-traumatic stress.

Limitations

The study has some limitations, several due to the nature of using routinely collected data from clinical services. The implications of our limited by the lack of a comparison group, for example, exploring uptake of other support services in a region without Hub support available. Likewise, whilst a high proportion of Hub clients gave consent for the use of their mental health screening data for research purposes, lack of consent precluded our ability to analyse the data to identify consent there were any differences between those who consented and those who did not. The findings report on mental health symptoms measured by standardised screening questionnaires, and whilst they are not taken in this study to represent psychiatric diagnoses, research suggests that such questionnaires may nevertheless over-estimate the prevalence of mental health difficulties amongst healthcare staff during the pandemic.²⁷ Our findings also suggest that the use of different instruments may substantially alter the observed prevalence of mental health difficulties in samples of health and social care workers. More specifically, while the ITQ and the PCL-5 are instruments designed to detect probable PTSD according to different diagnostic classification systems (ICD-11 and DSM-5, respectively), it is likely that their observed incongruence in our data may stem from other factors. While some reports suggest good convergent validity between these PTSD screeners, other reports have considerable diagnostic disagreement between these two tools in certain samples,²⁸ highlighting the need for further psychometric evaluation amongst health and social care workers. Finally, the current study explores 10% of the 40 Hubs set up during the pandemic, and the NHS England guidance around the Hubs' setup was broad and has been operationalised with high levels of local variation across Hubs, therefore these findings may not be representative of all staff wellbeing Hubs.

Clinical implications

The Hubs offered systems of support that seem to have provided an important offer for health and social care staff with significant mental health needs who may have otherwise struggled to directly access other sources of support via primary or

secondary mental health care services. Our data suggest an important need for services supporting these staff groups, in particular within the context of the multiple barriers to seeking and accessing mental health support that may be experienced by this population.²⁹ These findings further contextualise qualitative data from the wider mixed methods evaluation of the Hubs, which demonstrated that the Hubs were particularly valued by staff as a support service that was separate from occupational health services and from their organisations' patient records systems.¹³

Whilst our analyses suggest important considerations in relation to how Hub support might have reached certain occupational and ethnic minority groups less effectively, meaningful outreach and engagement with under-represented groups may help to address potential barriers to Hub service access in future.

While the acute impacts of the pandemic may no longer be perceived as urgently pressing on the wellbeing of health and social care staff, there is a clear and continued need to provide effective mental health and wellbeing support for health and social care staff. Although exacerbated by the pandemic, sickness absence due to mental health was already a pressing need prior to COVID-19,³⁰ and currently the most common reason for sickness absence in the NHS (25% of all absences) is 'anxiety/stress/depression/other psychiatric illness'.³⁰ These challenges are likely to continue to increase, in light of extreme pressures on the workforce, including staff retention issues and increasingly high job vacancies, and the above evidence around the delays in staff's help-seeking. On top of workforce issues, the cost-of-living crisis is also taking its toll on staff. Staff mental health and wellbeing support is therefore likely to continue to represent an important national challenge in the years to come, with potential indirect repercussions on the ability to deliver effective social and health care for the general population. Services like the Hubs could, pending further evaluation, represent an effective component of a broader response to this problem, however this response relies on continued funding which is currently under threat now that national funding for Hub services has ceased.

Research implications

While the present work highlights the high levels of mental health needs amongst Hub clients upon registration with these services, future research should seek to

establish the effectiveness of Hub services, for example through the longitudinal collection of mental health data for health and social care staff accessing Hub support, and the systematic comparison of data from staff wellbeing and occupational outcomes (e.g. severity of mental health difficulties; mental health work absences) in regions where Hub support is available and regions that have no available Hub support. As the availability of Hub support may decrease due to loss of national funding to support them post-pandemic, a large-scale naturalistic evaluation using a quasi-experimental design could be utilised to determine the clinical and cost-effectiveness of the model.

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Competing interests statement: PF has previously been a member of NIHR HTA Prioritisation Committee and is a current member of NIHR HTS Clinical Evaluation and Trials funding Committee. DH has previously been a member of NIHR Research for Patient Benefit, Yorks & NE Regional Advisory Committee, and is a current member of NIHR Health Technology Assessment Clinical Evaluation and Trials Funding Committee (2019-2024). LD is a current member of DMC/TSC for NIHR funded projects in mental health, but unrelated to Resilience Hub service. LAC is a current member of the NIHR Research for Patient Benefit North West Committee. FV has received an NIHR Advanced Fellowship in a clinical research area unrelated to the Resilience Hubs. FV, PF, DH, LD, GS, GB, LAC and JW are Investigators/Co-Investigators in several other NIHR projects funded by various funding streams (RfPB, HTA, EME, HS&DR). AB is an honorary member of the National Mental Health & Wellbeing expert reference group at NHS England and NHS Improvement. AB, JW, KMcG, and FV are members of the Greater Manchester Psychosocial Board, and JW, RW and KMcG are members of the Greater Manchester Expert Reference Group. LD is a member of an expert advisory board for Public Health England. GB is Interim co-chair of the National Institute of Health & Care Excellence (NICE) Quality Standards Advisory Committee. PF is clinical advisor to National

Clinical Audit of Psychosis at Royal College of Psychiatry and Board member of International Early Psychosis Association. GB, AB, HTC, KMcG, FH, JJ, MS, HW, RW, and JW have all held senior clinical and/or operational roles at the Hub sites involved in this study. PF has previously led research to evaluate the original Resilience Hub service set up to support those affected by the 2017 Manchester Arena bombing, in which DH and KA were also involved. KA has also held a research and evaluation role at a second Hub involved in this project.

Authors contribution: 1) Project leadership and coordination: FV, PF, KA; 2) Design and preparation of project protocol; FV, PF, DH, KA, AB, GB; 3) Data collection: HW, PC, SAW, EY, AH, JJ; 4) Data analysis: JW and LAC; 5) Initial draft of manuscript: FV, KA, HW, PF 6) Revising and final approval of manuscript: All authors.

Data sharing statement: All data requests should be submitted to Filippo.Varese@manchester.ac.uk for consideration. Access to anonymised data may be granted following review in consultation with broader study team and Sponsor.

Ethics statement: Ethical approval was granted for this study through North West – Preston Research Ethics Committee IRAS Project ID 290375 REC Reference 20/NW/0462.

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Table 1: Scoring of the routine self-report mental health screening measures administered to Hub clients at the four participating sites

Domain	Measure	Thresholds to evaluate the severity of MH difficulties	Availability of the measure at the four sites	'Caseness' definition for the current regression analyses
Depression	PHQ-9	Severe depression = 20-29 Moderately severe depression = 15-19 Moderate depression = 10-14 Mild depression = 5-9 No depression = 0-4	Hubs A, C, and D	Scores suggestive of at least moderate depression (PHQ \geq 10).
Anxiety	GAD-7	Severe anxiety = 15-21 Moderate anxiety = 10-14 Mild anxiety = 5-9 Minimal anxiety = 0-4	Hubs A, B, C, and D	Scores suggestive of at least moderate anxiety (GAD-7 \geq 10).
Post-traumatic stress	PCL-5	Probable PTSD = 31-80 Subthreshold for PTSD = 0-30	Hubs A, B, C, and D	Scores suggestive of probable PTSD (PCL-5 \geq 31).
	ITQ	Probable PTSD = scores of 2+ on at least one symptom/item of each PTSD cluster (intrusions, avoidance, hyperarousal); plus scores of 2+ on at least one item assessing associated functional impairment	Hubs C and D	Meeting ITQ criteria for probable PTSD or CPTSD.

		<p>Probable cPTSD = Meeting criteria for probable PTSD above; plus scores of 2+ on at least one symptom/item of each ‘disturbances of self organisation’ cluster (affect dysregulation, negative self-concept, disturbances in relationships); plus scores of 2+ on at least one item assessing associated functional impairment</p> <p>Subthreshold for PTSD/cPTSD = Not meeting criteria for probable PTSD above</p>		
Problematic alcohol use	AUDIT	<p>Possible alcohol dependence = 20-40</p> <p>Harmful alcohol consumption = 16-19</p> <p>Hazardous alcohol consumption = 8-15</p> <p>Low risk consumption = 1-7</p>	Hubs A, B, C and D	Scores suggestive of at least hazardous alcohol consumption (AUDIT ≥ 8).
Social and occupational impairment	WSAS	<p>Moderately severe or worse impairment: 20-40</p> <p>Significant impairment =10-19</p> <p>Low/no impairment = 0-9</p>	Hubs A, B, C and D	Scores suggestive of at least significant functional impairment (WSAS ≥ 10)

Table 2: N(%) of the demographic characteristics of the included Hub clients

	Site A (n = 475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (N=1973)
Mean Age	40.6 (10.6)	38.8 (11.4)	42.3 (11.2)	41.9 (11.4)	41.1 (11.2)
(SD)	0% missing	3.0% missing	0% missing	0% missing	0.5% missing
Ethnicity					
White British	433 (91.4)	327 (91.6)	367 (92.4)	586 (88.5)	1713 (90.6)
Other white	12 (2.5)	13 (3.6)	11 (2.8)	29 (4.4)	65 (3.4)
Black	1 (0.2)	1 (0.2)	4 (1.0)	7 (1.1)	13 (0.7)
Asian	20 (4.2)	10 (2.8)	6 (1.5)	29 (4.4)	65 (3.4)
Mixed	6 (1.3)	4 (1.1)	6 (1.5)	8 (1.2)	24 (1.3)
Other	2 (0.4)	2 (0.6)	3 (0.8)	3 (0.5)	10 (0.5)
Missing/ not stated	0.2% missing	2.7% missing	0.8% missing	9.4% missing	4.2% missing
Gender					
Woman	401 (84.4)	309 (86.3)	331 (82.8)	612 (84.2)	1653 (84.3)
Man	73 (15.4)	47 (13.1)	63 (15.8)	96 (13.2)	279 (14.2)
Identified in another way	1 (0.2)	2 (0.6)	2 (0.5)	19 (2.6)	24 (1.5)
Missing/ not stated	0% missing	0% missing	1% missing	0.4% missing	0.6% missing
Sexual orientation					
Heterosexual	420 (90.1)	307 (89.0)	318 (94.6)	587 (92.3)	1632 (91.5)
Identified in another way	46 (9.9)	38 (11.0)	18 (5.4)	49 (7.8)	151 (8.5)
Prefer not to say/ left blank	1.3% missing	6.0% missing	16.0% missing	13.0% missing	9% missing
Disability status (Yes)	64 (13.5)	30 (8.2)	72 (18.0)	29 (4.0)	195 (10.9)

Table 3: N (%) for of respondents endorsing COVID-19 impact items and pre-pandemic mental health / emotional wellbeing concerns

Question	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
Have you been impacted in any of these ways by COVID 19?					
ill with COVID-19	147 (30.9)	84 (23.2)	144 (36.8)	204 (28.7)	580 (29.9)
(recovered at home)	0% missing	1.4% missing	2.3% missing	2.9% missing	1.5% missing
ill with COVID-19 (including being in hospital)	19 (4.0)	10 (2.8)	23 (6.0)	12 (1.7)	64 (3.3)
	0% missing	1.4% missing	4.8% missing	5.2% missing	2.9% missing
family member ill with COVID (recovered at home)	119 (25.0)	68 (18.8)	136 (35.0)	187 (26.7)	511 (26.5)
	0% missing	1.4% missing	2.8% missing	4.2% missing	2.1% missing
family member ill with COVID (including being in hospital)	37 (7.8)	14 (3.9)	39 (10.1)	60 (8.7)	150 (7.8)
	0% missing	1.4% missing	3.8% missing	5.3% missing	2.7% missing
suffered financial loss within the household	84 (17.7)	33 (9.1)	84 (21.4)	152 (21.5)	353 (18.2)
	0% missing	1.4% missing	2.0% missing	3.3% missing	1.6% missing
Undertaking new tasks within usual role	245 (51.63)	173 (47.8)	193 (49.1)	409 (58.3)	1021 (52.7)
	0% missing	1.4% missing	1.8% missing	4.1% missing	1.9% missing
Seconded or redeployed to a different post	116 (26.2)	46 (12.7)	48 (12.2)	109 (16.2)	319 (17.0)
	6.9% missing	1.4% missing	1.8% missing	8.1% missing	5.2% missing
Moved to a different work location	153 (34)	61 (16.9)	105 (26.7)	253 (36.4)	572 (30.1)
	5.3% missing	1.4% missing	1.8% missing	4.9% missing	3.7% missing
Bereavement	71 (14.9)	44 (12.2)	65 (17.1)	168 (23.8)	348 (18.0)
	0% missing	1.4% missing	4.8% missing	3.3% missing	2.2% missing
Were you concerned about your emotional wellbeing before COVID?					
Yes	170 (36.3)	169 (46.9)	136 (34.0)	276 (38.3)	754 (38.6)
Unsure	102 (21.8)	57 (15.8)	64 (16.0)	124 (17.2)	347 (17.8)
	0% missing	1.9% missing	0% missing	1.5% missing	1.0% missing

Table 4: Mean (SD) and number (%) of participants meeting cut-offs for clinically significant difficulties across Hub screening measures

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
PHQ-9	14.4 (5.5)	13.8 (5.9)	13.2 (5.9)	11.4 (6.3)	12.9 (6.1)
None	21 (4.4)	15 (4.6)	27 (6.8)	117 (16.0)	180 (9.3)
Mild	73 (15.4)	76 (23.3)	94 (23.6)	185 (25.3)	428 (22.2)
Moderate	141 (29.7)	94 (28.9)	117 (29.3)	186 (25.4)	538 (27.9)
Moderately severe	149 (31.4)	78 (23.9)	94 (23.6)	159 (21.8)	480 (24.9)
Severe	91 (19.2)	63 (19.3)	67 (16.8)	84 (11.5)	305 (15.8)
Missing	0% missing	11.1% missing	0% missing	0% missing	2.1% missing
GAD-7	12.3 (4.9)	12.6 (5.4)	16 (5.5)	10.2 (6.1)	11.4 (5.7)
None	28 (5.9)	17 (5.2)	44 (11.0)	153 (20.9)	242 (12.5)
Mild	121 (25.5)	91 (28.0)	102 (25.6)	207 (28.3)	521 (27.0)
Moderate	146 (30.7)	84 (25.8)	124 (31.1)	164 (22.4)	518 (26.8)
Severe	180 (37.9)	133 (40.9)	129 (32.3)	207 (28.3)	649 (33.6)
Missing	0% missing	11.4% missing	0.3% missing	0% missing	2.2% missing
PCL-5	36.6 (16.6)	34.3 (16.7)	-	-	35.6 (16.7)
PTSD present	293 (61.7)	180 (55.4)	-	-	473 (59.1)
Missing	1.0% missing	11.4% missing	-	-	5.0% missing
ITQ score	-	-	8.8 (6.3)	8.2 (6.5)	8.4 (6.4)
PTSD present	-	-	40 (10.0)	56 (7.7)	96 (8.5)
Missing	-	-	0.3% missing	0% missing	0.1% missing
CPTSD present	-	-	97 (24.5)	147 (20.4)	244 (21.6)
Missing	-	-	1.0% missing	1.6% missing	1.4% missing
AUDIT	5.7 (5.8)	-	5.0 (5.1)	5.2 (5.0)	5.3 (5.3)
Low risk	351 (73.9)	-	322 (80.5)	564 (77.2)	1237 (77.0)

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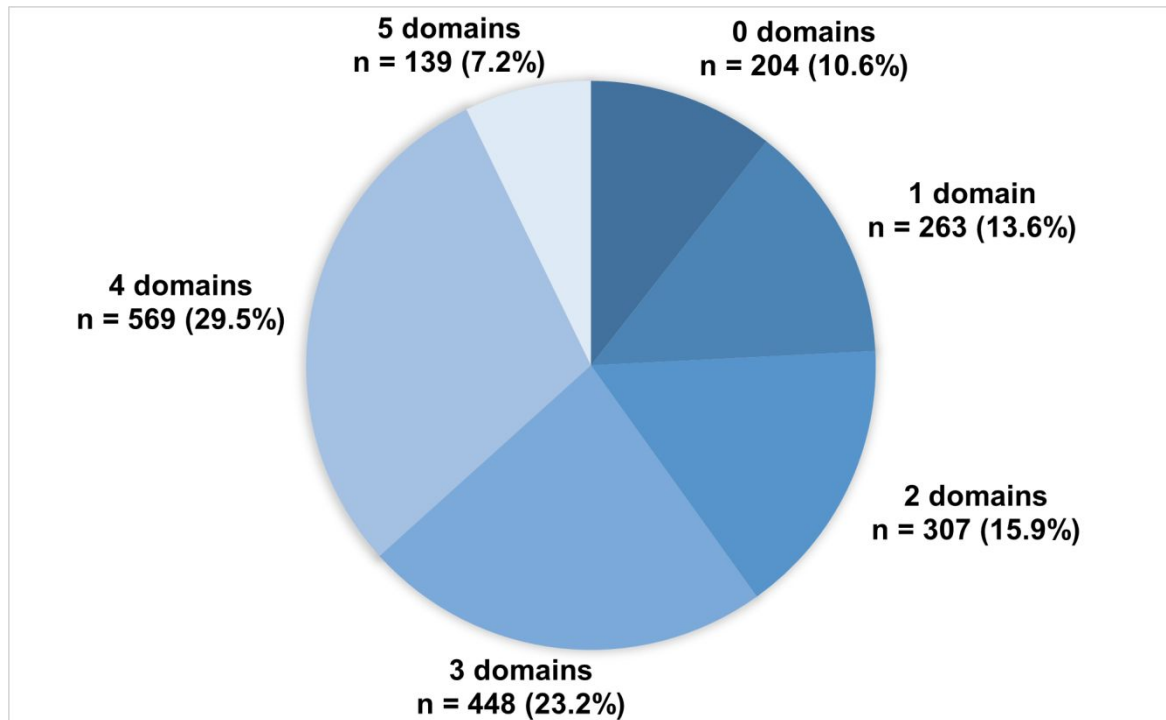
	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
Hazardous	88 (18.5)		63 (15.8)	131 (17.9)	282 (17.6)
Harmful	18 (3.8)		5 (1.3)	23 (3.1)	46 (2.9)
Possible dependence	18 (3.8)		10 (2.5)	13 (1.8)	41 (2.6)
Missing	0% missing	-	0% missing	0% missing	0% missing
WSAS	18.9 (8.3)	17.5 (7.9)	17.9 (9.5)	15.1 (9.3)	17.0 (9.0)
Subclinical	65 (13.7)	55 (16.9)	77 (19.3)	213 (29.1)	410 (21.2)
Significant	213 (44.8)	152 (46.6)	170 (42.5)	311 (42.5)	846 (43.8)
Moderately severe or worse	197 (41.5)	119 (36.5)	153 (38.3)	207 (28.3)	676 (35.0)
Missing	0% missing	11.2% missing	0% missing	0% missing	2.1% missing
Overall severity					
Low	24 (5)	23 (6.3)	29 (7.3)	128 (17.5)	204 (10.3)
Moderate	104 (21.9)	71 (19.3)	128 (32.0)	230 (31.5)	533 (27.0)
High	347 (73.1)	232 (63.2)	243 (60.8)	373 (51.0)	1195 (60.6)
Missing	0% missing	11.2% missing	0% missing	0% missing	2.1% missing

Note: Clinical cut-off scores for Hub screening measures: **PHQ-9:** 0-4 = none, 5-9 = mild, 10-14 = moderate, 15-19 = moderately severe, 20-29 = severe; **GAD-7:** 0-4 = none, 5-9 = mild, 10-14 = moderate, 15-21 = severe; **PCL-5:** 31+ probable PTSD; **ITQ:** probable PTSD diagnosis indicated by a score of 2+ on at least one symptom of each PTSD cluster along with associated functional impairment, probable cPTSD diagnosis indicated by meeting PTSD criteria and a score of 2+ on at least one symptom from each DSO cluster along with associated functional impairment; **AUDIT:** 1-7 = low risk, 8-15 = hazardous, 16-19 = harmful, 20+ = possible dependence; **WSAS:** 0-9 = subclinical, 10-19 = significant, 20+ = moderately severe or worse

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Figures

Figure 1: Cumulative breakdown of participant numbers meeting 'caseness' criteria across domains assessed via Hubs' mental health and functional screening tools (depression, anxiety, post-traumatic stress, problematic alcohol use, functional impairment).



Supplementary material

1. Definition of the “overall severity” variable

The measure of ‘overall severity’ used in our regression analyses was defined from the screening questionnaires as the highest severity grade received across the questionnaires using the categorisation system illustrated in the Table below. If the scores across all available measure were consistent with the mildest severity classification for each measure, a person was categorised as presenting a “low” severity profile. If the person’s highest severity grade was consistent with those listed in the moderate column, a ‘moderate’ severity category was applied. If the person scored in the higher tiers of severity in at least one measure, a “high” severity classification was applied. Missing data was allowed on any measure, with overall severity being calculated from the available measures. Overall severity was set as missing if all measures had missing data for that individual.

Supplementary Table 1: Overall severity table

Overall severity	PHQ9	GAD7	PCL-5	ITQ	AUDIT	WSAS
LOW	None; Mind	None; Mild	No PTSD	No PTSD/CPTSD	Low risk	Subclinical
MODERATE	Moderate; Moderately severe	Moderate	n/a	n/a	Hazardous	Significant
HIGH	Severe	Severe	PTSD present	PTSD / CPTSD present	Harmful; Possible dependence	Moderately severe or worse

2. Occupational characteristics of the sample

Supplementary Table 2: N (%) for the occupational data of the sample.

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
NHS	289 (60.2)	315 (87.0)	222 (57.8)	312 (44.0)	1138 (58.9)
Primary care	31 (6.5)	15 (4.1)	20 (5.2)	66 (9.3)	132 (6.8)
Social care	18 (3.8)	13 (3.6)	26 (6.5)	59 (8.3)	116 (6.0)
Emergency services	20 (4.2)	3 (0.8)	45 (11.7)	30 (4.2)	98 (5.0)
Education	14 (2.9)	0 (0)	1 (0.2)	9 (1.3)	24 (1.2)

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
VCSE	2 (0.4)	0 (0)	13 (3.4)	36 (5.1)	51 (2.6)
Local authority	17 (3.5)	0 (0)	4 (1)	15 (2.1)	36 (1.9)
Other*	84 (17.5)	16 (4.4)	54 (14.1)	182 (25.7)	336 (17.4)
Missing	0% missing	1.4% missing	4% missing	3% missing	2.1% missing

Note: All percentages calculated excluding missing values

*In all sites other than Site D, free text information about job role were available, therefore it was often possible to re-categorise clients from 'Other' to one of the main reported categories included in the table, most commonly to the NHS category. However, this open text response option was not available for Site D, hence a high proportion of 'Other' job roles.

3. Regression tables for the caseness and overall severity analyses

Supplementary Table 3: Summary of logistic regression analyses of PHQ-9 caseness

Predictor	OR	95% CI		p	Interaction p-value
<u>Demographics</u>					
Age	1	0.99	1.01	0.416	0.525
Gender (man vs woman)	1.02	0.77	1.36	0.879	0.744
Gender (identified in another way vs woman)	0.75	0.36	1.62	0.507	-
Ethnicity (ethnic minority vs white)	0.66	0.43	1.03	0.063	0.044
ICU/critical care	1.14	0.81	1.64	0.458	0.466
Clinical vs non-clinical	0.67	0.44	1.01	0.062	0.024
Sexual orientation (identified in another way vs heterosexual)	1.89	0.123	2.94	0.004	0.969
Disability					0.264
	1.71	1.19	2.53	0.005	

Predictor	OR	95% CI		p	Interaction p-value
<i>Impacts of COVID</i>					
COVID illness (home)	1.21	0.97	1.5	0.094	0.266
COVID illness (hospital)	1.32	0.74	2.48	0.364	0.483
COVID family member (home)	1.21	0.96	1.52	0.11	0.228
COVID family member (hospital)	1.06	0.74	1.54	0.763	0.995
Financial loss	1.48	1.14	1.95	0.004	0.489
Undertaking new tasks	1.23	1.01	1.51	0.038	<0.001
Seconded or re-deployed	0.93	0.71	1.23	0.616	0.661
Moved work location	1.22	0.98	1.53	0.076	0.211
Bereavement	1.26	0.97	1.64	0.089	0.242
<i>Pre-pandemic MH concerns</i>					
Yes (vs no)	2.03	1.62	2.53	<0.001	0.085
Unsure (vs no)	1.81	1.37	2.42	0.001	-

Supplementary Table 4: Summary of logistic regression analyses of GAD-7 caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.98	0.97	0.99	<0.001	0.576
Gender (man vs woman)	0.95	0.73	1.25	0.725	0.726

Predictor	OR	95% CI		p	Interaction p-value
Gender (identified in another way vs woman)	0.78	0.37	1.64	0.507	-
Ethnicity (ethnic minority vs white)	1.14	0.74	1.79	0.547	0.432
ICU/critical care	1.15	0.83	1.6	0.406	0.843
Clinical vs non-clinical	0.98	0.67	1.41	0.899	0.689
Sexual orientation (identified in another way vs heterosexual)	1.32	0.92	1.92	0.13	0.477
Disability	1.17	0.85	1.63	0.33	0.230
<i><u>Impacts of COVID</u></i>					
COVID illness (home)	0.9	0.74	1.1	0.311	0.003
COVID illness (hospital)	0.82	0.49	1.38	0.445	0.68
COVID family member (home)	1.13	0.91	1.4	0.272	0.001
COVID family member (hospital)	1.39	0.97	2.01	0.074	0.715
Financial loss	1.28	1	1.64	0.049	0.649
Undertaking new tasks	1.13	0.94	1.37	0.194	0.583
Seconded or re-deployed	0.92	0.71	1.19	0.521	0.494
Moved work location	1.21	0.98	1.49	0.074	0.192
Bereavement	1.38	1.07	1.77	0.012	0.613
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	2.05	1.66	2.53	<0.001	0.399
Unsure (vs no)	1.66	1.28	2.17	0.001	-

Supplementary Table 5: Summary of logistic regression analyses of PTSD caseness based on the PCL-5

Predictor	OR	95% CI	p	Interaction p-value	
<i>Demographics</i>					
Age	1	0.99	1.01	0.927	0.73
Gender (man vs woman)	1.09	0.73	1.65	0.681	0.633
Gender (identified in another way vs woman) *	-	-	-	-	-
Ethnicity (ethnic minority vs white)	1.89	0.93	4.15	0.093	0.296
ICU/critical care	2.23	1.45	3.52	<0.001	0.536
Clinical vs non-clinical	0.92	0.49	1.67	0.781	NA**
Sexual orientation (identified in another way vs heterosexual)	1.59	0.99	2.63	0.062	0.627
Disability	1.79	1.12	2.94	0.018	0.384
<i>Impacts of COVID</i>					
COVID illness (home)	1.00	0.73	1.37	0.998	0.821
COVID illness (hospital)	2.56	1.09	7.02	0.044	0.436
COVID family member (home)	0.98	0.7	1.37	0.898	0.273
COVID family member (hospital)	1.27	0.7	2.38	0.445	0.227
Financial loss	1.72	1.12	2.69	0.015	0.019
Undertaking new tasks	0.97	0.73	1.29	0.826	0.004
Seconded or re-deployed	1.05	0.73	1.52	0.797	0.390

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Predictor	OR	95% CI		p	Interaction p-value
Moved work location	0.98	0.71	1.37	0.928	0.762
Bereavement	1.48	0.97	2.29	0.072	0.030
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	1.95	1.42	2.7	<0.001	0.623
Unsure (vs no)	1.29	0.87	1.91	0.205	-

Note: * This model was not computable due to small numbers ** No interaction was computable as PCL-5 data were available for one site only

Supplementary Table 6: Summary of logistic regression analyses of PTSD caseness based on the ITQ

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.99	0.98	1	0.191	0.923
Gender (man vs woman)	1.17	0.82	1.67	0.381	0.818
Gender (identified in another way vs woman)	1.13	0.46	2.55	0.783	-
Ethnicity (ethnic minority vs white)	1.32	0.74	2.3	0.333	0.263
ICU/critical care	1.44	0.83	2.45	0.184	0.844
Clinical vs non-clinical	1.1	0.69	1.8	0.686	0.239
Sexual orientation (identified in another way vs heterosexual)	1.20	0.70	2.00	0.501	0.211
Disability	1.32	0.84	2.03	0.22	0.522

Predictor	OR	95% CI		p	Interaction p-value
<i>Impacts of COVID</i>					
COVID illness (home)	0.83	0.62	1.09	0.187	0.504
COVID illness (hospital)	1.25	0.6	2.49	0.539	0.121
COVID family member (home)	1.27	0.96	1.67	0.097	0.639
COVID family member (hospital)	1.62	1.06	2.48	0.025	0.596
Financial loss	1.57	1.16	2.13	0.003	0.382
Undertaking new tasks	1.71	1.31	2.25	<0.001	0.713
Seconded or re-deployed	1.39	0.97	1.99	0.07	0.406
Moved work location	1.49	1.13	1.95	0.004	0.043
Bereavement	1.91	1.41	2.58	<0.001	0.314
<i>Pre-pandemic MH concerns</i>					
Yes (vs no)	1.59	1.20	2.11	0.001	0.34
Unsure (vs no)	1.07	0.73	1.55	0.72	-

Supplementary Table 7: - Summary of logistic regression analyses of AUDIT caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	1	0.99	1.01	0.909	0.553

Predictor	OR	95% CI		p	Interaction p-value
Gender (man vs woman)	2.35	1.74	3.16	<0.001	0.291
Gender (identified in another way vs woman)	1.40	0.54	3.21	0.455	-
Ethnicity (ethnic minority vs white)	0.24	0.09	0.51	0.001	0.151
ICU/critical care	1.43	0.98	2.08	0.061	0.009
Clinical vs non-clinical	1.35	0.87	2.16	0.19	0.004
Sexual orientation (identified in another way vs heterosexual)	1.47	0.95	2.22	0.072	0.167
Disability	0.65	0.41	0.98	0.049	0.214
<i><u>Impacts of COVID</u></i>					
COVID illness (home)	1.07	0.83	1.37	0.622	0.77
COVID illness (hospital)	0.2	0.05	0.54	0.006	0.329
COVID family member (home)	1.1	0.84	1.42	0.488	0.476
COVID family member (hospital)	0.74	0.46	1.15	0.2	0.568
Financial loss	1.17	0.87	1.55	0.291	0.807
Undertaking new tasks	1.38	1.09	1.76	0.008	0.627
Seconded or re-deployed	0.93	0.67	1.27	0.648	0.651
Moved work location	0.71	0.55	0.93	0.012	0.943
Bereavement	1.3	0.97	1.73	0.07	0.136
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	1.18	0.90	1.53	0.226	0.018

Predictor	OR	95% CI		p	Interaction p-value
Unsure (vs no)	1.53	1.12	2.09	0.008	-

Supplementary Table 8: Part 2- Summary of logistic regression analyses of WSAS caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.99	0.98	1	0.198	0.061
Gender (man vs woman)	1.12	0.81	1.56	0.498	0.498
Gender (identified in another way vs woman)	1.42	0.6	3.88	0.456	-
Ethnicity (ethnic minority vs white)	0.87	0.54	1.45	0.568	0.481
ICU/critical care	0.85	0.59	1.26	0.409	0.674
Clinical vs non-clinical	0.66	0.41	1.03	0.078	0.2
Sexual orientation (identified in another way vs heterosexual)	2.44	1.45	4.35	0.002	0.189
Disability	1.93	1.23	3.15	0.006	0.190
<i>Impacts of COVID</i>					
COVID illness (home)	1.23	0.96	1.59	0.1	0.576
COVID illness (hospital)	1.26	0.66	2.67	0.513	0.882
COVID family member (home)	1.62	1.24	2.14	0.001	0.473
COVID family member (hospital)	1.06	0.71	1.64	0.772	0.628

Predictor	OR	95% CI		p	Interaction p-value
Financial loss	1.59	1.17	2.19	0.004	0.912
Undertaking new tasks	1.13	0.9	1.41	0.295	0.129
Seconded or re-deployed	0.83	0.62	1.13	0.237	0.195
Moved work location	1.06	0.83	1.36	0.643	0.839
Bereavement	1.08	0.81	1.45	0.595	0.173
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	2.29	1.77	2.97	<0.001	0.018
Unsure (vs no)	1.71	1.25	2.37	0.001	-

Supplementary Table 9: Part 2 - Summary of proportional odds logistic regression analyses of overall severity across the Hub screening measures

Predictor	OR	95% CI	p	Interaction p-value	
<u>Demographics</u>					
Age	0.99	0.98	1.00	0.05	0.91
Gender (man vs woman)	1.07	0.82	1.40	0.62	0.83
Gender (identified in another way vs woman)	1.07	0.52	2.25	0.86	-
Ethnicity (ethnic minority vs white)	0.85	0.56	1.32	0.47	0.19
ICU/critical care	1.28	0.92	1.81	0.15	0.60
Clinical vs non-clinical*	0.81	0.56	1.16	0.26	Not computable

Predictor	OR	95% CI		p	Interaction p-value
Sexual orientation (identified in another way vs heterosexual)	1.75	1.22	2.63	0.004	0.28
Disability	1.70	1.21	2.41	0.003	0.58
<i>Impacts of COVID</i>					
COVID illness (home)	1.18	0.97	1.45	0.11	0.19
COVID illness (hospital)	1.44	0.83	2.61	0.21	0.93
COVID family member (home)	1.31	1.06	1.63	0.01	0.13
COVID family member (hospital)	1.18	0.83	2.61	0.21	0.82
Financial loss	1.84	1.43	2.39	<0.001	0.92
Undertaking new tasks	1.19	0.99	1.44	0.06	0.04
Seconded or re-deployed	1.04	0.81	1.35	0.76	0.42
Moved work location	1.15	0.94	1.41	0.19	0.22
Bereavement	1.25	0.98	1.60	0.07	0.30
<i>Pre-pandemic MH concerns</i>					
Yes vs no	2.11	1.72	2.59	<0.001	0.15
Yes vs unsure	1.43	1.08	1.90	0.01	-

* It was not possible to adjust this analysis for site due to the distribution of the outcome across sites in the subgroup of NHS workers. Attempting to do so resulted in non-convergence of the model.

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Demographic, occupational factors and pandemic-related stressors associated with heightened mental health difficulties amongst UK health and social care workers supported by regional Resilience Hubs during the COVID-19 pandemic

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Complete List of Authors:	<p>Varese, Filippo; The University of Manchester, School of Health Sciences, Manchester Academic Health Science Centre; Greater Manchester Mental Health NHS Foundation Trust, Complex Trauma & Resilience Research Unit</p> <p>Allsopp, Kate; Greater Manchester Mental Health NHS Foundation Trust, Research & Innovation; The University of Manchester Division of Psychology and Mental Health, Division of Psychology and Mental Health</p> <p>Carter, Lesley-Anne; The University of Manchester, Centre for Biostatistics, Division of Population Health, Health Services Research and Primary Care</p> <p>Wilkinson, Jack; University of Manchester, Centre for Biostatistics; Salford Royal NHS Foundation Trust, Research and Development</p> <p>Shields, Gemma; University of Manchester, Centre for Health Economics</p> <p>Rowlandson, Aleix; The University of Manchester, Centre for Health Economics</p> <p>Chung, Priscilla; Lancashire and South Cumbria NHS Foundation Trust, Lancashire and South Cumbria Resilience Hub</p> <p>Hassan, Alysha; Mersey Care NHS Foundation Trust, Cheshire & Merseyside Resilience Hub</p> <p>White, Hannah; Greater Manchester Mental Health NHS Foundation Trust, Research and Innovation</p> <p>Wright, Sally-Anne; Lancashire and South Cumbria NHS Foundation Trust, Lancashire and South Cumbria Resilience Hub</p> <p>Young, Ellie; Pennine Care NHS Foundation Trust, Greater Manchester Resilience Hub</p> <p>Davey, Jess; Tees Esk and Wear Valleys NHS Foundation Trust, Humber & North Yorkshire Resilience Hub</p> <p>Barrett, Alan; Pennine Care NHS Foundation Trust, Greater Manchester Resilience Hub; University of Salford, School of Health & Society</p> <p>Bhutani, Gita; Lancashire and South Cumbria NHS Foundation Trust, Lancashire & South Cumbria Resilience Hub; Greater Manchester Mental Health NHS Foundation Trust, Complex Trauma & Resilience Research Unit</p> <p>Hind, Daniel; The University of Sheffield, SchARR</p> <p>McGuirk, Katherine; NHS Greater Manchester Health and Social Care Partnership</p> <p>Huntley, Fay; University of Edinburgh, Doctorate of Clinical Psychology</p>



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Demographic, occupational factors and pandemic-related stressors associated with heightened mental health difficulties amongst UK health and social care workers supported by regional Resilience Hubs during the COVID-19 pandemic

Filippo Varese,^{1,2} Kate Allsopp,^{2,1} Lesley-Anne Carter,¹ Jack Wilkinson,¹ Gemma Shields,¹ Aleix Rowlandson,¹ Priscilla Chung,³ Alysha Hassan,⁴ Hannah White,² Sally-Anne Wright,³ Ellie Young,⁵ Jess Davey,⁶ Alan Barrett,^{5,7} Gita Bhutani,^{3,8} Dan Hind,⁹ Katherine McGuirk,^{5,10} Fay Huntley,⁴ May Sarsam,⁴ Holly Walker,⁶ Joanne Jordan,⁶ Hein Ten Cate,³ Ruth Watson,^{2,5} Jenni Willbourn,⁵ Paul French,^{11,12}

¹ University of Manchester, School of Health Sciences, Faculty of Biology, Medicine and Health, Manchester Academic Health Science Centre, Oxford Road, Manchester M13 9PL

² Greater Manchester Mental Health NHS Foundation Trust, Manchester Academic Health Science Centre, Research and Innovation, 3rd Floor Rawnsley Building, Hathersage Road, Manchester M13 9WL

³ Lancashire and South Cumbria Resilience Hub, Lancashire and South Cumbria NHS Foundation Trust, Sceptre Point, Sceptre Way, Walton Summit, Preston, PR5 6AW

⁴ Cheshire and Merseyside Resilience Hub, Mersey Care NHS Foundation Trust, V7 Building, Kings Business Park, Prescot, L34 1PJ

⁵ Greater Manchester Resilience Hub, Pennine Care NHS Foundation Trust, Trust Headquarters, 225 Old Street, Ashton-under-Lyne, Lancashire OL6 7SR

⁶ Humber & North Yorkshire Resilience Hub, Tees Esk and Wear Valleys NHS Foundation Trust, West Park Hospital, Edward Pease Way, Darlington DL2 2TS

⁷ University of Salford, School of Health & Society, Mary Seacole Building, Frederick Road Campus, Broad St, Salford, M6 6PU

⁸ University of Liverpool, School of Psychology, Ground floor, Whelan Building Quadrangle Brownlow Hill Liverpool L69 3GB

⁹ University of Sheffield, School of Health and Related Research, The Innovation Centre, 217 Portobello, Sheffield, S1 4DP

¹⁰ Greater Manchester Health and Social Care Partnership, 4th Floor, 3 Piccadilly Place, Manchester, M1 3BN

¹¹ Manchester Metropolitan University, Faculty of Health, Psychology and Social Care, Brooks Building, Bonsall Street, Manchester M15 6GX

¹² Pennine Care NHS Foundation Trust, Trust Headquarters, 225 Old Street, Ashton-under-Lyne, Lancashire OL6 7SR

Corresponding author: Professor Filippo Varese
(Filippo.Varese@manchester.ac.uk)

Abstract

Background: During the COVID-19 pandemic, 40 Mental Health and Wellbeing Hubs were funded in England to support health and social care staff affected by the pandemic.

Aims: To describe the characteristics of staff accessing four Hubs for support, and identify characteristics associated with clinically significant mental health difficulties and work and social functioning.

Method: Routinely collected screening data were analysed from 1973 individuals across four Hubs, including mental health, demographic and occupational data, and pandemic-related stressors. Factors associated with clinically significant mental health difficulties were identified via logistic regression.

Results: Most Hub clients identified as white women who worked for the UK National Health Service; other groups were less well represented. Hub clients reported high levels of clinically significant mental health difficulties: 60% had severe and often co-occurring difficulties (i.e. depression, anxiety, PTSD or alcohol use) and 80% reported significantly impaired functioning. Younger age, disability status, identifying as from a minority ethnic group, and sexual orientations excluding heterosexual were associated with higher likelihood of having clinically significant mental health difficulties. Suffering financial loss during the pandemic, and pre-pandemic emotional wellbeing concerns were the most consistent factors associated with higher difficulties.

Conclusions: The Hubs supported health and social care staff with significant mental health difficulties. Outreach and engagement with under-represented groups should be undertaken to address potential barriers to service access. The findings add to the knowledge-base on the support needs of the health and social care workforce and the planning of support in response to future crises.

Study registration: researchregistry6303

Strengths and limitations of this study

- This is the first study exploring the characteristics of health and social care staff registering for support with staff wellbeing hubs ('Resilience Hubs') funded by NHS England during the COVID-19 pandemic, and which of these characteristics were associated with more severe mental health difficulties.
- The study has a large sample size of 1973 individuals who gave consent for use of their data for research purposes, across four Resilience Hubs, representing 83% of the staff who referred themselves to the Hubs between 1st June 2020 and 31st December 2021.
- The study is limited by the lack of a comparison group, for example, staff who accessed alternative support services in a region without Hub support available.
- Finally, the current study explores 10% of the 40 Hubs set up during the pandemic. NHS England guidance for the setup of staff wellbeing hubs was broad, and has been operationalised with high levels of local variation across Hubs, therefore these findings may not be representative of all staff wellbeing hubs.

Introduction

The COVID-19 pandemic has affected the mental health of health and social care staff.^{1,2} Systematic reviews have demonstrated high levels of depression, anxiety and post-traumatic stress symptoms throughout the pandemic.^{3,4} Pooled prevalence from one review suggested that globally, 49% of healthcare staff reported problems with insomnia, 47% anxiety, and 37% with post-traumatic stress.⁵ Research suggests that the mental health of staff from Black, Asian, and minority ethnic communities may have been particularly affected.⁶ Staff working in intensive care units (ICU) or critical care services are more likely to have experienced post-traumatic stress and other mental health difficulties.⁷ Whilst there is limited research on the mental health of care home staff, the impact appears no less severe.⁸

NHS England, the commissioning body that oversees the publicly-funded healthcare system, the National Health Service (NHS), in England, funded 40 resilience or wellbeing hubs to support staff during the pandemic.⁹ These Hubs were modelled on a service called the Greater Manchester Resilience Hub, which was originally set up to support people affected by a 2017 terrorist bombing in Manchester (UK). These resilience/wellbeing hubs offered a range of services to support health and social care staff affected by their work during the pandemic. Details of the support offered by the four Resilience Hubs involved in this study are published elsewhere.¹⁰ The purpose of these services during the pandemic was to facilitate access to NHS-recommended mental health support for health and social care professionals. These dedicated services, which had a focus on proactive outreach, were established with the aim of resolving known barriers to help-seeking amongst health and social care staff, and to avoid placing additional strain on other mental health services during the pandemic.¹¹ Support offered by the Hubs is consistent with NHS guidance on supporting mental wellbeing at work.¹²

As newly established services, the characteristics of people accessing Hub services during the pandemic, or how these characteristics related to mental health need, was not known. Information regarding the characteristics of staff who presented with more severe mental health issues (i.e. potentially requiring more intensive and bespoke mental health support) gathered during the pandemic may be beneficial to the more efficient planning of support services such as the Resilience Hubs should

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their activation be required in response to novel crises, and/or ongoing staff mental health support initiatives. The objectives of this study were therefore to analyse the demographic and occupational characteristics of health and social care staff who accessed four Resilience Hubs for support during the pandemic, to explore characteristics that were associated with higher mental health need and work and social functional difficulties, to identify health and social care staff who may benefit from mental health support.

The quantitative findings presented in this paper are one component of the wider mixed methods evaluation to maximise learning from the UK's response to the early phases of the COVID-19 pandemic in relation to the implementation of this innovative system of support for responding to increased mental health needs populations and specific groups affected large scale crises.¹³ Findings pertaining to other workstreams of the Resilience Hubs Evaluation are reported elsewhere.^{10,14}

Method

Ethical approval

Ethical approval was granted for this study through North West – Preston Research Ethics Committee IRAS Project ID 290375 REC Reference 20/NW/0462.

Setting

Four Hubs were involved in the study. Hub names have been anonymised and are described below as Sites A-D. The Hubs became operational at different timepoints due to variation in setup times, and most of the Hubs involved in the study opened in stages to different staffing groups. The earliest Hub to open was Site D in May 2020. The other Hubs became operational between November 2020 and February 2021. Mental health screening formed a part of the self-referral process at all Hubs involved in the evaluation, although there were some variations across services. All Hubs encouraged online self-referral, and the completion of mental health screening data was either conducted as part of the online self-referral form, or, at one Hub, online questionnaires were sent to Hub clients after their referral was accepted and prior to their first assessment session. Further information regarding what these

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3 mental health services comprised, and how people could refer themselves, can be
4 found in a detailed service mapping published elsewhere.
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8 **Participants**

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10 Hub clients were defined as staff members eligible for Hub support who had been
11 referred or self-referred for individual support from one of four Resilience Hubs in the
12 North West of England. There were no exclusion criteria. Health and social care staff
13 supported by the Hubs included, broadly, staff working with NHS or private
14 healthcare organisations, and staff working in social care organisations, such as
15 residential care homes. Clinical, managerial, administrative, and ancillary staff at in-
16 scope organisations were all eligible to access Hubs for support. Some further
17 information is provided elsewhere about in-scope staffing groups for Hubs involved
18 in this study.¹⁰
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27 To avoid confusion between staff working at the Hubs and people accessing Hub
28 services, the paper will refer to the latter as ‘Hub clients’, or ‘participants’ for Hub
29 clients who were included in the research. All participants 1) were over 18 years of
30 age, 2) completed screening at one of the Hubs between 1st June 2020 and 31st
31 December 2021 and 3) consented for their data to be used for research purposes.
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40 **Data sources**

41 All Hubs routinely collected data on symptoms of depression (using the *Patient*
42 *Health Questionnaire*; PHQ-9¹⁵), anxiety (the *General Anxiety Disorder scale*; GAD-
43 7¹⁶), and social and occupational functional impairment (the *Work and Social*
44 *Adjustment Scale*; ¹⁷WSAS). The Hubs also administered screening tools for Post-
45 Traumatic Stress Disorder, but different instruments were employed at the
46 participating Hubs (Sites A and B used the *PTSD Checklist for the DSM-5*, PCL-5;¹⁸
47 Sites C and D used the *International Trauma Questionnaire*, ITQ¹⁹). Three Hubs
48 (Sites A, C and D) also collected data on harmful alcohol use using the *Alcohol Use*
49 *Disorders Identification Test* (AUDIT).²⁰
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58 Details on the scoring of the above instruments, including the scoring thresholds and
59 criteria we used to examine the prevalence of clinically significant difficulties in the
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above domains (i.e. depression, anxiety, post-traumatic stress, problematic alcohol use and functioning) are summarised in Table 1. Hereafter, the term 'caseness' is used to refer to meeting these thresholds for clinically significant difficulties.

Table 1: Scoring of the routine self-report mental health screening measures administered to Hub clients at the four participating sites

Domain	Measure	Thresholds to evaluate the severity of MH difficulties	Availability of the measure at the four sites	'Caseness' definition for the current regression analyses
Depression	PHQ-9	Severe depression = 20-29 Moderately severe depression = 15-19 Moderate depression = 10-14 Mild depression = 5-9 No depression = 0-4	Hubs A, B, C and D	Scores suggestive of at least moderate depression (PHQ ≥ 10).
Anxiety	GAD-7	Severe anxiety = 15-21 Moderate anxiety = 10-14 Mild anxiety = 5-9 Minimal anxiety = 0-4	Hubs A, B, C and D	Scores suggestive of at least moderate anxiety (GAD-7 ≥ 10).
Post-traumatic stress	PCL-5	Probable PTSD = 31-80 Subthreshold for PTSD = 0-30	Hubs A & B	Scores suggestive of probable PTSD (PCL-5 ≥ 31).
	ITQ	Probable PTSD = scores of 2+ on at least one symptom/item of each PTSD cluster (intrusions, avoidance, hyperarousal); plus scores of 2+ on at least one item assessing associated functional impairment Probable cPTSD = Meeting criteria for probable PTSD above; plus scores of 2+ on at least one symptom/item of each 'disturbances of self organisation' cluster (affect	Hubs C & D	Meeting ITQ criteria for probable PTSD or CPTSD.

		dysregulation, negative self-concept, disturbances in relationships); plus scores of 2+ on at least one item assessing associated functional impairment		
		Subthreshold for PTSD/cPTSD = Not meeting criteria for probable PTSD above		
Problematic alcohol use	AUDIT	Possible alcohol dependence = 20-40 Harmful alcohol consumption = 16-19 Hazardous alcohol consumption = 8-15 Low risk consumption = 1-7	Hubs A, C and D	Scores suggestive of at least hazardous alcohol consumption (AUDIT ≥ 8).
Social and occupational impairment	WSAS	Moderately severe or worse impairment: 20-40 Significant impairment =10-19 Low/no impairment = 0-9	Hubs A, B, C and D	Scores suggestive of at least significant functional impairment (WSAS ≥ 10)

The Hubs also collected data on a range of Hub clients’ self-reported characteristics relevant to the planned analyses, including 1) *demographic data* (age, gender, ethnicity, disability status and sexual orientation, 2) *occupational and work environment characteristics* (Hub clients’ work setting and job role), 3) whether Hub clients had *pre-pandemic concerns about their emotional wellbeing / mental health* (e.g. “Were you concerned about your emotional wellbeing/mental health before COVID-19?”), and 4) information on *common impacts of COVID during the acute phase of the pandemic*. The latter covered whether the person had been impacted by COVID-19 in any of the following ways: 1) seconded to a different post; 2) moved to work in a different location; 3) undertaking new tasks within usual role; 4) been ill with confirmed COVID-19 (recovered at home); 5) been ill with confirmed COVID-19 (including being in hospital); 6) family member been ill with confirmed COVID-19 (recovered at home); 7) family member been ill with confirmed COVID-19 (included

being in hospital); 8) experienced family/close friend bereavement; 9) suffered financial loss within the household.

Procedures

All individuals screened by the Hubs were invited to give consent for their anonymised data to be used for research purposes. This consent to data use was asked at one time point, as the screening questionnaires were completed at a single time point as part of the routinely collected data at the point of self-referral to Hubs. However, Hub clients could request Hubs to withdraw this consent at any time. At the point of data lock for the study (31st December 2021), screening data was only transferred to the research team for Hub clients who had consented to anonymised data use for research purposes on that date.

Relevant data for all consenting Hub clients was extracted from the Hubs' electronic patient records systems, cleaned, and anonymised by research assistants (RAs) based at each Hub. The data was compiled onto a central database managed by the study statisticians, who performed quality checking and relevant re-coding/cleaning ahead of the planned analyses.

Analysis

For each Hub, we numerically summarised data on participant demographic and occupational characteristics, reported COVID-19 impacts and pre-pandemic emotional wellbeing / mental health concerns. Data from mental health screening questionnaires were summarised numerically as total scores and used to determine the number of participants meeting threshold for clinically significant difficulties across the assessed domains. A series of logistic regression models, adjusted for Hubs due to the multi-site nature of the data, were conducted to examine the association between each independent variable and 'caseness' on each mental health screening outcome variable. To evaluate whether these relationships varied across the Hubs, all models were refitted with an interaction between the variable under consideration and site. The interaction was assessed using a Likelihood Ratio Test for logistic regression models. To offer some protection against spurious findings arising from multiple testing, we used a significance threshold of $p < 0.001$

for interaction analyses to identify potential differences across Hubs. Owing to the large number of tests performed, p-values should be considered nominal; significant associations are best interpreted as exploratory. A final set of analyses was conducted using proportional odds ordinal logistic regression analyses, adjusted for site, to identify potential factors associated with higher ‘overall severity’ variable across the various standardised screening measures collected by the Hubs. This three-level categorical variable was defined by the highest severity categorisation received on any of Hubs screening questionnaires (further detail on the definition of this derived variable is available in full, see Supplementary Material).

Missing data

Due to different data collection policies at the participating Hubs (i.e. whether or not Hub clients were invited to complete clinical screening measures at registration, and whether they were given the option of ‘skipping’ particular items or instruments), data availability varied according to site. For example, Hub B presented notably higher missing data on the mental health screening measures Hub clients were invited to complete (i.e. approximately 11%) compared to other Hubs (where missing data was in most cases < 1%). Most of the other variables considered in our analyses, data missingness was < 3%, with the notable exclusion of certain demographic variables (in particular ethnicity and sexual orientation, which presented higher numbers of not stated and ‘prefer not to say’ answers at certain sites). As the above suggests that data were unlikely to be missing at random, only observed data were used in the descriptive and regression analyses reported below.

Results

Data for 1973 Hub clients across the four Resilience Hubs were included in the analyses, representing the 83% of people who referred themselves to the Hubs between 1st June 2020 and 31st December 2021 and gave consent for the use of their anonymised data for research purposes.

In terms of occupational background, most Hub clients were NHS employees. A sizable minority of these NHS employees (30% of all NHS participants) worked in intensive care settings. Only a relatively small proportion reported working in social

care settings (6%) or in emergency services (5%; see Supplementary Table 2 for a more detailed breakdown of the occupational characteristics of the sample). The demographic characteristics the sample are displayed in *Table 2*. Given the substantial preponderance of NHS employees amongst Hub clients and the small representation of certain occupational sectors in the available data, subsequent analyses aimed at identifying occupational variables associated with greater mental health needs focused on more specific occupational variables that may convey heightened risk (e.g. working in high risk settings like ICUs/critical care) as opposed to broad occupational sectors.

Table 2: N(%) of the demographic characteristics of the included Hub clients

	Site A (n = 475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (N=1973)
Mean Age (SD)	40.6 (10.6) <i>0% missing</i>	38.8 (11.4) <i>3.0% missing</i>	42.3 (11.2) <i>0% missing</i>	41.9 (11.4) <i>0% missing</i>	41.1 (11.2) <i>0.5% missing</i>
Ethnicity					
White British	433 (91.4)	327 (91.6)	367 (92.4)	586 (88.5)	1713 (90.6)
Other white	12 (2.5)	13 (3.6)	11 (2.8)	29 (4.4)	65 (3.4)
Black	1 (0.2)	1 (0.2)	4 (1.0)	7 (1.1)	13 (0.7)
Asian	20 (4.2)	10 (2.8)	6 (1.5)	29 (4.4)	65 (3.4)
Mixed	6 (1.3)	4 (1.1)	6 (1.5)	8 (1.2)	24 (1.3)
Other	2 (0.4)	2 (0.6)	3 (0.8)	3 (0.5)	10 (0.5)
Missing/ not stated	<i>0.2% missing</i>	<i>2.7% missing</i>	<i>0.8% missing</i>	<i>9.4% missing</i>	<i>4.2% missing</i>
Gender					
Woman	401 (84.4)	309 (86.3)	331 (82.8)	612 (84.2)	1653 (84.3)
Man	73 (15.4)	47 (13.1)	63 (15.8)	96 (13.2)	279 (14.2)
Identified in another way	1 (0.2)	2 (0.6)	2 (0.5)	19 (2.6)	24 (1.5)
Missing/ not stated	<i>0% missing</i>	<i>0% missing</i>	<i>1% missing</i>	<i>0.4% missing</i>	<i>0.6% missing</i>
Sexual orientation					
Heterosexual	420 (90.1)	307 (89.0)	318 (94.6)	587 (92.3)	1632 (91.5)
Identified in another way	46 (9.9)	38 (11.0)	18 (5.4)	49 (7.8)	151 (8.5)
Prefer not to say/ left blank	<i>1.3% missing</i>	<i>6.0% missing</i>	<i>16.0% missing</i>	<i>13.0% missing</i>	<i>9% missing</i>
Disability status (Yes)	64 (13.5)	30 (8.2)	72 (18.0)	29 (4.0)	195 (10.9)

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Overall, the demographic characteristics of Hub clients were similar across Hubs. The average age of clients was 41.1 years (SD = 11.2), ranging from 38.8 years to 42.3 years across Hubs. The available ethnicity data indicated that clients were predominantly of white British background (90% across Hubs). In terms of gender and sexual orientation, 84% of Hub clients identified as women, and 91.5% identified as straight/heterosexual. Self-reported information on disability status was more variable, ranging between 4% and 18% across Hubs. Of note, these differences may be due to variances in how questions on disability status were framed at different Hubs (i.e. at Sites B and D items to confirm lack of a disability were embedded within an extensive, alphabetically ordered list of potential disabilities, which may have led to high levels of missingness).

As summarised in Table 3, considerable proportions of participants experienced a range of adverse pandemic-related personal and occupational circumstances prior to completing the screening offer of the Hubs, and many clients reported having emotional wellbeing concerns that preceded the onset of the pandemic.

Table 3: N (%) for of respondents endorsing COVID-19 impact items and pre-pandemic mental health / emotional wellbeing concerns

Question	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
Have you been impacted in any of these ways by COVID 19?					
ill with COVID-19 (recovered at home)	147 (30.9) 0% missing	84 (23.2) 1.4% missing	144 (36.8) 2.3% missing	204 (28.7) 2.9% missing	580 (29.9) 1.5% missing
ill with COVID-19 (including being in hospital)	19 (4.0) 0% missing	10 (2.8) 1.4% missing	23 (6.0) 4.8% missing	12 (1.7) 5.2% missing	64 (3.3) 2.9% missing
family member ill with COVID (recovered at home)	119 (25.0) 0% missing	68 (18.8) 1.4% missing	136 (35.0) 2.8% missing	187 (26.77) 4.2% missing	511 (26.5) 2.1% missing
family member ill with COVID (including being in hospital)	37 (7.8) 0% missing	14 (3.9) 1.4% missing	39 (10.1) 3.8% missing	60 (8.7) 5.3% missing	150 (7.8) 2.7% missing

suffered financial	84 (17.7)	33 (9.1)	84 (21.4)	152 (21.5)	353 (18.2)
loss within the	0% missing	1.4% missing	2.0% missing	3.3% missing	1.6% missing
household					
Undertaking new	245 (51.63)	173 (47.8)	193 (49.1)	409 (58.3)	1021 (52.7)
tasks within usual	0% missing	1.4% missing	1.8% missing	4.1% missing	1.9% missing
role					
Seconded or	116 (26.2)	46 (12.7)	48 (12.2)	109 (16.2)	319 (17.0)
redeployed to a	6.9% missing	1.4% missing	1.8% missing	8.1% missing	5.2% missing
different post					
Moved to a	153 (34)	61 (16.9)	105 (26.7)	253 (36.4)	572 (30.1)
different work	5.3% missing	1.4% missing	1.8% missing	4.9% missing	3.7% missing
location					
Bereavement	71 (14.9)	44 (12.2)	65 (17.1)	168 (23.8)	348 (18.0)
	0% missing	1.4% missing	4.8% missing	3.3% missing	2.2% missing
Were you concerned about your emotional wellbeing before COVID?					
Yes	170 (36.3)	169 (46.9)	136 (34.0)	276 (38.3)	754 (38.6)
Unsure	102 (21.8)	57 (15.8)	64 (16.0)	124 (17.2)	347 (17.8)
	0% missing	1.9% missing	0% missing	1.5% missing	1.0% missing

Mental health and functional screening data

As illustrated in Table 4, a large proportion of Hub clients had been negatively affected by significant mental health and/or functional difficulties. The proportion of participants presenting PHQ-9 scores above the cut-off for moderate depression was 81%. In terms of anxiety, 60% of participants had GAD-7 scores above the cut-off for moderate anxiety. In Hubs that used the PCL-5, 59% of clients had scores suggestive of probable PTSD. Conversely, a lower observed prevalence of possible trauma-related disorders (PTSD and complex PTSD) was observed when the ITQ was used (34% at Site C and 28% at Site D). The proportion of participants presenting AUDIT scores above the cut-off for hazardous alcohol use was 23%. Most Hub clients presented WSAS scores above threshold for significant impairment in functioning (79%).

Table 4: Mean (SD) and number (%) of participants meeting cut-offs for clinically significant difficulties across Hub screening measures

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
PHQ-9	14.4 (5.5)	13.8 (5.9)	13.2 (5.9)	11.4 (6.3)	12.9 (6.1)
None	21 (4.4)	15 (4.6)	27 (6.8)	117 (16.0)	180 (9.3)
Mild	73 (15.4)	76 (23.3)	94 (23.6)	185 (25.3)	428 (22.2)
Moderate	141 (29.7)	94 (28.9)	117 (29.3)	186 (25.4)	538 (27.9)
Moderately severe	149 (31.4)	78 (23.9)	94 (23.6)	159 (21.8)	480 (24.9)
Severe	91 (19.2)	63 (19.3)	67 (16.8)	84 (11.5)	305 (15.8)
Missing	0% missing	11.1% missing	0% missing	0% missing	2.1% missing
GAD-7	12.3 (4.9)	12.6 (5.4)	16 (5.5)	10.2 (6.1)	11.4 (5.7)
None	28 (5.9)	17 (5.2)	44 (11.0)	153 (20.9)	242 (12.5)
Mild	121 (25.5)	91 (28.0)	102 (25.6)	207 (28.3)	521 (27.0)
Moderate	146 (30.7)	84 (25.8)	124 (31.1)	164 (22.4)	518 (26.8)
Severe	180 (37.9)	133 (40.9)	129 (32.3)	207 (28.3)	649 (33.6)
Missing	0% missing	11.4% missing	0.3% missing	0% missing	2.2% missing
PCL-5	36.6 (16.6)	34.3 (16.7)	-	-	35.6 (16.7)
PTSD present	293 (61.7)	180 (55.4)			473 (59.1)
Missing	1.0% missing	11.4% missing	-	-	5.0% missing
ITQ score	-	-	8.8 (6.3)	8.2 (6.5)	8.4 (6.4)
PTSD present			40 (10.0)	56 (7.7)	96 (8.5)
Missing		-	0.3% missing	0% missing	0.1% missing
CPTSD present	-	-	97 (24.5)	147 (20.4)	244 (21.6)
Missing			1.0% missing	1.6% missing	1.4% missing
AUDIT	5.7 (5.8)	-	5.0 (5.1)	5.2 (5.0)	5.3 (5.3)
Low risk	351 (73.9)		322 (80.5)	564 (77.2)	1237 (77.0)
Hazardous	88 (18.5)		63 (15.8)	131 (17.9)	282 (17.6)
Harmful	18 (3.8)		5 (1.3)	23 (3.1)	46 (2.9)

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
Possible dependence	18 (3.8)		10 (2.5)	13 (1.8)	41 (2.6)
Missing	0% missing	-	0% missing	0% missing	0% missing
WSAS	18.9 (8.3)	17.5 (7.9)	17.9 (9.5)	15.1 (9.3)	17.0 (9.0)
Subclinical	65 (13.7)	55 (16.9)	77 (19.3)	213 (29.1)	410 (21.2)
Significant	213 (44.8)	152 (46.6)	170 (42.5)	311 (42.5)	846 (43.8)
Moderately severe or worse	197 (41.5)	119 (36.5)	153 (38.3)	207 (28.3)	676 (35.0)
Missing	0% missing	11.2% missing	0% missing	0% missing	2.1% missing
Overall severity					
Low	24 (5)	23 (6.3)	29 (7.3)	128 (17.5)	204 (10.3)
Moderate	104 (21.9)	71 (19.3)	128 (32.0)	230 (31.5)	533 (27.0)
High	347 (73.1)	232 (63.2)	243 (60.8)	373 (51.0)	1195 (60.6)
Missing	0% missing	11.2% missing	0% missing	0% missing	2.1% missing

Note: Clinical cut-off scores for Hub screening measures: **PHQ-9:** 0-4 = none, 5-9 = mild, 10-14 = moderate, 15-19 = moderately severe, 20-29 = severe; **GAD-7:** 0-4 = none, 5-9 = mild, 10-14 = moderate, 15-21 = severe; **PCL-5:** 31+ probable PTSD; **ITQ:** probable PTSD diagnosis indicated by a score of 2+ on at least one symptom of each PTSD cluster along with associated functional impairment, probable cPTSD diagnosis indicated by meeting PTSD criteria and a score of 2+ on at least one symptom from each DSO cluster along with associated functional impairment; **AUDIT:** 1-7 = low risk, 8-15 = hazardous, 16-19 = harmful, 20+ = possible dependence; **WSAS:** 0-9 = subclinical, 10-19 = significant, 20+ = moderately severe or worse

In terms of overall severity, 60% of Hub clients scored in the most severe range of scores on at least one mental health screening measure (see Table 1 for categories of severity and definition of caseness for each measure, e.g. severe depression or anxiety; moderately severe or worse functional impairment; or possible alcohol dependence, and Supplementary Table 1 for summarised data on overall severity across measures). Only 10% of users presented scores in the lowest range of severity across all measures (e.g. no depression; minimal anxiety; subthreshold for

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PTSD etc). As illustrated in Figure 1, most participants had scores suggestive of multiple co-morbid difficulties, with 60% of the sample meeting caseness criteria on at least three different screening measures.

[Insert Figure 1 approximately here]

Factors associated with elevated mental health and functional difficulties

The results of the logistic regression analyses exploring factors associated with elevated mental health and functional difficulties amongst Hub clients are summarised below, and reported in full in Supplementary Tables 2-7.

The regression analyses to identify factors associated with higher likelihood of PHQ-9 caseness found that having a disability (OR = 1.71; 95%CI [1.19, 2.53], $p = .005$), a minority sexual orientation (i.e., participants identifying as any sexual orientation other than heterosexual; OR = 1.89, 95%CI [1.23, 2.94], $p = .004$), suffering a financial loss (OR = 1.48; 95%CI [1.14, 1.95], $p = .004$), and having pre-pandemic emotional wellbeing concerns (OR = 2.03; 95%CI [1.62, 2.53], $p < .001$) were associated with higher likelihood for caseness. Undertaking new work-related tasks was also associated with greater likelihood of caseness (OR = 1.23; 95%CI [1.01, 1.51], $p = .038$), with interaction analyses indicating more pronounced PHQ-9 caseness risk at Site D relatively to other Hubs ($p < .001$).

The GAD-7 analyses found evidence of decreased likelihood of caseness with older age (OR = 0.98; 95%CI [0.97, 0.99], $p < .001$). Suffering a financial loss (OR = 1.28; 95%CI [1.00, 1.64], $p = .049$), having had a bereavement (OR = 1.38; 95%CI [1.07, 1.77], $p = .012$), and reporting pre-pandemic emotional wellbeing concerns (OR = 2.05; 95%CI [1.66, 2.53], $p < .001$) were associated with higher likelihood for caseness.

In terms of PTSD, working in ICU/critical care and having a disability was associated with higher likelihood of having PCL-5 scores suggestive of probable diagnosis for PTSD (OR = 2.23; 95%CI [1.45, 3.52], $p < .001$). Undertaking new tasks (OR = 1.71;

95%CI [1.31, 2.25], $p < .001$), moving to a new work location (OR = 1.49; 95%CI [1.13, 1.95], $p = .004$) and suffering a bereavement (OR = 1.91; 95%CI [1.41, 2.58], $p < .001$) were associated with higher likelihood of PTSD caseness on the ITQ. In both the PCL-5 and ITQ analyses, pre-pandemic emotional wellbeing concerns (OR = 1.95; 95%CI [1.42, 2.70], $p < .001$ and OR = 1.59; 95%CI [1.20, 2.11], $p = .001$ respectively) and suffering a financial loss (OR = 1.72; 95%CI [1.12, 2.69], $p = .015$ and OR = 1.57; 95%CI [1.16, 2.13], $p = .003$ respectively) were associated with increased likelihood of probable PTSD.

The AUDIT caseness analyses indicated that identifying as a man (OR = 2.35; 95%CI [1.74, 3.16], $p < .001$) and undertaking new tasks (OR = 1.38; 95%CI [1.09, 1.76], $p = .008$) were associated with increased risk for problematic alcohol use. Conversely, identifying as an ethnic minority (OR = 0.24; 95%CI [0.09, 0.51], $p = .001$), having a disability (OR = 0.65; 95%CI [0.41, 0.98], $p = .049$), having experienced a hospitalisation because of COVID (OR = 0.20; 95%CI [0.05, 0.54], $p = .006$) and moving to a new work location (OR = 0.71; 95%CI [0.55, 0.93], $p = .001$) were associated with lower risk for problematic alcohol use.

The analyses to identify factors associated with significant impairments in functioning found that identifying as any sexual orientation other than heterosexual (OR = 2.44; 95%CI [1.45, 4.35], $p = .002$), having a disability (OR = 1.93; 95%CI [1.23, 3.15], $p = .006$), having a family member recovering from COVID at home (OR = 1.62; 95%CI [1.24, 2.14], $p = .001$), suffering a financial loss (OR = 1.59; 95%CI [1.17, 2.19], $p = .004$), and pre-pandemic emotional wellbeing concerns (OR = 2.29; 95%CI [1.77, 2.97], $p < .001$) were associated with a higher likelihood of presenting with WSAS scores indicative of significant impairment in functioning.

The results of the proportional odds ordinal logistic regression analyses to identify factors associated with greater overall severity across the various mental health screening measures used by the Hubs are displayed in *Supplementary Tables 8 and 9*. In these analyses, ORs relate to the odds of being in a higher severity category (moderate, high) in presence of the putative risk factor (or, for age, for each one-year increase).

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Age was negatively associated with severity rating, such that people with higher age tended to have lower overall severity ratings (OR = 0.99; 95%CI [0.98, 1.00], $p = .05$). Identifying as any sexual orientation other than heterosexual was associated with higher rating (OR = 1.75; 95%CI [1.22, 2.63], $p = .004$). Presence of a disability (OR = 1.70; 95%CI [1.21, 2.41], $p = .003$), a family member having COVID-19 and recovering at home (OR = 1.31; 95%CI [1.06, 1.63], $p = .01$), suffering financial loss (OR = 1.84; 95%CI [1.43, 2.39], $p < .001$), and pre-pandemic emotional wellbeing concerns (OR = 2.11; 95%CI [1.72, 2.59], $p < .001$) were associated with higher ratings. We did not find evidence that associations varied across Hubs

Discussion

This study represents the first multi-site evaluation of the demographic and occupational characteristics of clients who accessed Resilience Hub services dedicated to supporting the mental health needs of health and social care workers during the COVID-19 pandemic. The severity of, and factors associated with, common mental health difficulties amongst these help-seeking, high-risk occupational groups were explored to inform ongoing and future strategies for supporting the health and social care workforce.

The findings indicated that most Hub clients who completed the Hub screening offer worked in NHS healthcare settings, with considerably smaller proportions of respondents working for other in-scope sectors. Hub clients included in these analyses predominantly identified as women and from a white background. These figures are in contrast with workforce demographics across health and social care sector, whereby men typically make up 18% and 24% of the workforce for social care and the NHS respectively.^{21,22} People identifying as from a Black, Asian, or minority ethnic background typically make up 23% and 30% of the workforce for social care and the NHS respectively.^{21,22} It is unlikely that the observed difference between the demographics of our sample and those of the broader NHS and social care workforce could be entirely attributable to self-selection for the present analyses (i.e., as participants consented for their anonymised data to be used for research purposes) or geographical variances. The findings are therefore suggestive that Hub clients may under-represent specific demographic and occupational groups, including individuals from Black, Asian and minority ethnic groups, men and people

working in social care and emergency services. While some of these differences may be due to restrictions of support to certain groups as per evolving national guidance during the study, e.g. around inclusion of emergency service workers, as well as phased opening of offers that prioritised certain occupational groups, these findings highlight possible issues with the visibility and/or accessibility of Hub support for certain in-scope occupational and demographic groups, which could be addressed as part of future initiatives to better target these under-represented groups. Qualitative findings from the wider mixed methods study expand on potential barriers that different demographic and occupational groups experienced in accessing support during the pandemic.¹⁴ Barriers for staff from minoritised ethnic communities, for example, included being discouraged from accessing the Hubs due to past negative experiences from other NHS services; limited representation of diversity on Hub clinical teams; and a perception that Hubs were less well equipped to support staff with the impact of racism.¹⁴ Barriers for other staff included limited accommodation for out of hours sessions for those doing shift work, and lack of cover at work for care home staff.¹⁴

Participants presented with considerable mental health needs across all domains assessed. The prevalence of mental health difficulties was broadly comparable across Hubs, but with slightly lower observed figures for Site D but also marked differences in PTSD caseness between Hubs that used different instruments to assess post-traumatic stress i.e., ITQ was associated with lower detected caseness relatively to PCL-5. Approximately 80% of Hub clients had scores suggestive of significant impairments in functioning. Furthermore, 60% of Hub clients scored in the most severe range of scores on at least one of the screening measures, whilst only 10% had subclinical scores across all measures. These figures are generally congruent with the findings of other research highlighting elevated mental health needs amongst health and social care staff during the COVID-19 pandemic as well as elevated pre-pandemic mental health risk in certain occupational groups (e.g., healthcare workers).²³ Nonetheless, the observed prevalence of significant difficulties in this study is striking, and likely due to the help-seeking nature of this sample. These findings, alongside data indicating that a considerable proportion of Hub clients reported being concerned about their emotional wellbeing prior to the pandemic, suggest that the Hub clients presented with a degree of complexity,

characterised by multiple co-occurring mental health difficulties which impacted functioning, as well as difficulties that may be long-lasting, i.e., they may have preceded (and potentially aggravated by) the COVID-19 pandemic. Whilst our analyses did not account for temporal trends, it is possible that levels of 'caseness' may have varied, and potentially increased, over the course of the pandemic. This would be consistent with the relatively lower prevalence of difficulties observed at that became fully operational in earlier phases of the pandemic (e.g., Site D).

Our analyses identified several characteristics associated with clinically significant mental health concerns in this sample. Older age was found to be associated with reduced risk for anxiety and overall severity of presentations. Participants who described their ethnic background as white were at higher risk for problematic alcohol use. Individuals who identified as men had elevated risk for alcohol-related problems. Hub clients who identified with any sexual orientation other than heterosexual were at elevated risk for depression, alcohol misuse, functional impairment, and higher overall severity. Having a disability was associated with increased risk for depression, post-traumatic stress, functional impairment, and higher overall severity, but also a reduced risk for alcohol-related problems compared to participants who did not report any disability on the screening questionnaires. These findings are consistent with those of prior studies focusing on the association between these individual characteristics and mental health difficulties in both specific staff groups eligible for Hub support (e.g., healthcare workers) and the general population.^{7,24–26}

While fine-grained analyses considering the relative risk of specific occupational characteristics were unviable (due to the heterogeneity in which this information was collected across sites), our analyses focusing on ICU/Critical care workers (a particular 'high risk' group due to their high level of disease exposure during the pandemic) found evidence suggestive of particularly elevated risk for post-traumatic stress. This finding is consistent with recent UK research reporting high levels of probable PTSD and other mental health difficulties in this group.⁷ Other occupational variables potentially associated with higher risk included specific stressful circumstances experienced during the pandemic. Being seconded or redeployed into different work roles was not associated with increased risk; this finding is surprising

in that other pandemic literature demonstrates the negative impact of redeployment.²⁷ However, the finding may be explained by the broad category of redeployment, as certain experiences of redeployment have been found to have a particularly negative mental health impact compared with others, including redeployment to ICU wards, or redeployment without adequate training.²⁸ Moving to a new work location (a closely related variable) was associated with increased risk for PTSD, whereas undertaking new tasks was associated with increased risk for depression, post-traumatic stress, and problematic alcohol use.

In line with findings from other research, other stressful life circumstances experienced during the pandemic also had an impact on the mental health difficulties reported by the present sample.^{4,29} Suffering a financial loss during the pandemic was (together with having pre-pandemic emotional wellbeing concerns) the most consistent variable associated with higher likelihood for caseness across all the domains assessed by the Hub screening measures. Having recovered from severe COVID illness which involved hospitalisation and/or having a family member undergoing a similar adverse experience was associated with increased risk for post-traumatic stress. Conversely, having family members who recovered at home from COVID was associated with higher anxiety risk as well as greater functional impairment. Suffering a bereavement was associated with increased risk for anxiety and post-traumatic stress.

Limitations

The study has some limitations, several due to the nature of using routinely collected data from clinical services. The implications of our research are limited by the lack of a comparison group, for example, exploring uptake of other support services in a region without Hub support available. Likewise, whilst a high proportion of Hub clients gave consent for the use of their mental health screening data for research purposes, lack of consent precluded our ability to analyse the data to identify whether there were any differences between those who consented and those who did not. The findings report on mental health symptoms measured by standardised screening questionnaires, and whilst they are not taken in this study to represent psychiatric diagnoses, research suggests that such questionnaires may nevertheless over-estimate the prevalence of mental health difficulties amongst healthcare staff

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1 during the pandemic.³⁰ Our findings also suggest that the use of different instruments
2 may substantially alter the observed prevalence of mental health difficulties in
3 samples of health and social care workers. More specifically, while the ITQ and the
4 PCL-5 are instruments designed to detect probable PTSD according to different
5 diagnostic classification systems (ICD-11 and DSM-5, respectively), it is likely that
6 their observed incongruence in our data may stem from other factors. While some
7 reports suggest good convergent validity between these PTSD screeners, other
8 reports have considerable diagnostic disagreement between these two tools in
9 certain samples,³¹ highlighting the need for further psychometric evaluation amongst
10 health and social care workers. Finally, the current study explores 10% of the 40
11 Hubs set up during the pandemic, and the NHS England guidance around the Hubs'
12 setup was broad and has been operationalised with high levels of local variation
13 across Hubs, therefore these findings may not be representative of all staff wellbeing
14 Hubs.

25 26 27 28 29 *Clinical implications*

30 These findings further contextualise qualitative data from the wider mixed methods
31 evaluation of the Hubs, which demonstrated that the Hubs were particularly valued
32 by staff as a support service that was separate from occupational health services
33 and from their organisations' patient records systems.¹⁴ The Hubs offered systems of
34 support that seem to have provided an important offer for health and social care staff
35 with significant mental health needs who may have otherwise struggled to directly
36 access other sources of support via primary or secondary mental health care
37 services. The present data, alongside our previously published qualitative work,¹⁴
38 suggest an important need for services supporting these staff groups, in particular
39 within the context of the multiple barriers to seeking and accessing mental health
40 support that may be experienced by this population.³²

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51 Whilst our analyses suggest important considerations in relation to how Hub support
52 might have reached certain occupational and ethnic minority groups less effectively,
53 meaningful outreach and engagement with under-represented groups may help to
54 address potential barriers to Hub service access in future.

While the acute impacts of the pandemic may no longer be perceived as urgently pressing on the wellbeing of health and social care staff, there is a clear and continued need to provide effective mental health and wellbeing support for health and social care staff. Although exacerbated by the pandemic, sickness absence due to mental health was already a pressing need prior to COVID-19,³³ and currently the most common reason for sickness absence in the NHS (25% of all absences) is 'anxiety/stress/depression/other psychiatric illness'.³³ These challenges are likely to continue to increase, in light of extreme pressures on the workforce, including staff retention issues and increasingly high job vacancies, and the above evidence around the delays in staff's help-seeking. On top of workforce issues, the cost-of-living crisis is also taking its toll on staff. Staff mental health and wellbeing support is therefore likely to continue to represent an important national challenge in the years to come, with potential indirect repercussions on the ability to deliver effective social and health care for the general population. Services like the Hubs could, pending further evaluation, may represent an effective component of a broader response to this problem, however this response relies on continued funding which is currently under threat now that national funding for Hub services has ceased.

Research implications

While the present work highlights the high levels of mental health needs amongst Hub clients upon registration with these services, future research should seek to establish the effectiveness of Hub services, for example through the longitudinal collection of mental health data for health and social care staff accessing Hub support, and the systematic comparison of data from staff wellbeing and occupational outcomes (e.g. severity of mental health difficulties; mental health work absences) in regions where Hub support is available and regions that have no available Hub support. As the availability of Hub support may decrease due to loss of national funding to support them post-pandemic, a large-scale naturalistic evaluation using a quasi-experimental design could be utilised to determine the clinical and cost-effectiveness of the model.

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are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.

Competing interests statement: PF has previously been a member of NIHR HTA Prioritisation Committee and is a current member of NIHR HTS Clinical Evaluation and Trials funding Committee. DH has previously been a member of NIHR Research for Patient Benefit, Yorks & NE Regional Advisory Committee, and is a current member of NIHR Health Technology Assessment Clinical Evaluation and Trials Funding Committee (2019-2024). LAC is a current member of the NIHR Research for Patient Benefit North West Committee. FV has received an NIHR Advanced Fellowship in a clinical research area unrelated to the Resilience Hubs. FV, PF, DH, GS, GB, LAC and JW are Investigators/Co-Investigators in several other NIHR projects funded by various funding streams (RfPB, HTA, EME, HS&DR). AB is an honorary member of the National Mental Health & Wellbeing expert reference group at NHS England and NHS Improvement. AB, JW, KMcG, and FV are members of the Greater Manchester Psychosocial Board, and JW, RW and KMcG are members of the Greater Manchester Expert Reference Group. GB is Interim co-chair of the National Institute of Health & Care Excellence (NICE) Quality Standards Advisory Committee. PF is clinical advisor to National Clinical Audit of Psychosis at Royal College of Psychiatry and Board member of International Early Psychosis Association. GB, AB, HTC, KMcG, FH, JJ, MS, HWa, RW, and JW have all held senior clinical and/or operational roles at the Hub sites involved in this study. PF has previously led research to evaluate the original Resilience Hub service set up to support those affected by the 2017 Manchester Arena bombing, in which DH and KA were also involved. KA has also held a research and evaluation role at a second Hub involved in this project. PC, AH, HWh, SAW, EY, and JD declare no competing interests.

Authors contribution: 1) Project leadership and coordination: FV, PF, KA; 2) Design and preparation of project protocol; FV, PF, DH, KA, AB, GB; 3) Data collection: HWh, PC, SAW, EY, AH, JD; 4) Data analysis: JW and LAC; 5) Initial draft of manuscript: FV, KA, HWh, PF 6) Revising and final approval of manuscript: FV, KA, LAC, JW, GS, AR, AB, GB, DH, KM, FH, MS, HW, JJ, HTC, RW, JW, PF. 7) FV is guarantor.

Data sharing statement: All data requests should be submitted to Filippo.Varese@manchester.ac.uk for consideration. Access to anonymised data may be granted following review in consultation with broader study team and Sponsor.

Ethics statement: Ethical approval was granted for this study through North West – Preston Research Ethics Committee IRAS Project ID 290375 REC Reference 20/NW/0462.

Patient & Public Involvement: The patient and public involvement and experience group (Staff Consultation Group) for the overarching study included health and social care staff who had accessed Hub support. The group reviewed study procedures and were consulted on the interpretation of findings.

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Figure legends:

Figure 1: Cumulative breakdown of participant numbers meeting ‘caseness’ criteria across domains assessed via Hubs’ mental health and functional screening tools (depression, anxiety, post-traumatic stress, problematic alcohol use, functional impairment).

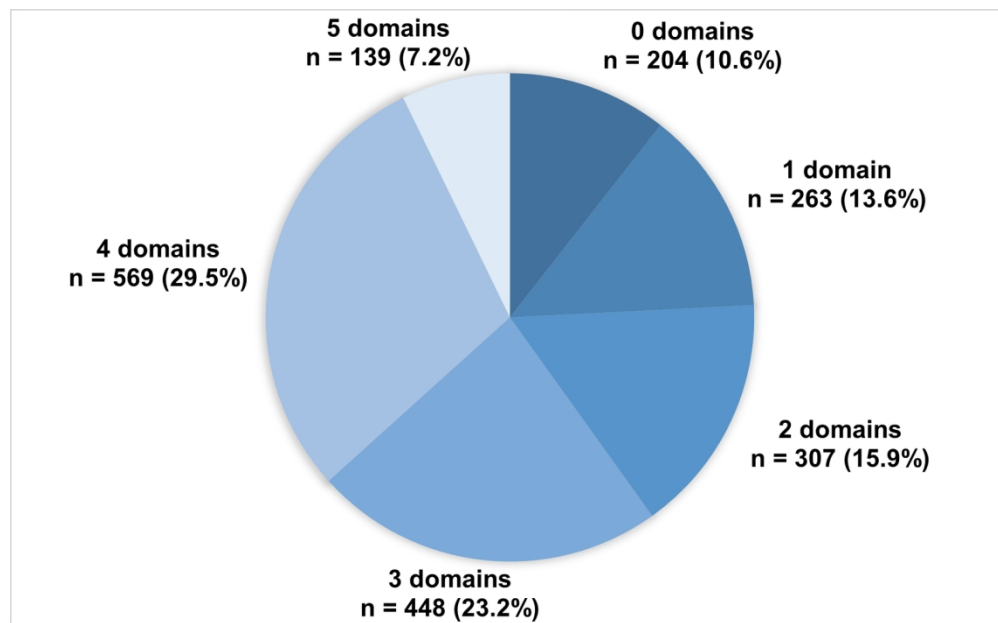


Figure 1: Cumulative breakdown of participant numbers meeting 'caseness' criteria across domains assessed via Hubs' mental health and functional screening tools (depression, anxiety, post-traumatic stress, problematic alcohol use, functional impairment)

154x95mm (300 x 300 DPI)

Supplementary material

1. Definition of the “overall severity” variable

The measure of ‘overall severity’ used in our regression analyses was defined from the screening questionnaires as the highest severity grade received across the questionnaires using the categorisation system illustrated in the Table below. If the scores across all available measure were consistent with the mildest severity classification for each measure, a person was categorised as presenting a “low” severity profile. If the person’s highest severity grade was consistent with those listed in the moderate column, a ‘moderate’ severity category was applied. If the person scored in the higher tiers of severity in at least one measure, a “high” severity classification was applied. Missing data was allowed on any measure, with overall severity being calculated from the available measures. Overall severity was set as missing if all measures had missing data for that individual.

Supplementary Table 1: Overall severity table

Overall severity	PHQ9	GAD7	PCL-5	ITQ	AUDIT	WSAS
LOW	None; Mind	None; Mild	No PTSD	No PTSD/CPTSD	Low risk	Subclinical
MODERATE	Moderate; Moderately severe	Moderate	n/a	n/a	Hazardous	Significant
HIGH	Severe	Severe	PTSD present	PTSD / CPTSD present	Harmful; Possible dependence	Moderately severe or worse

2. Occupational characteristics of the sample

Supplementary Table 2: N (%) for the occupational data of the sample.

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
NHS	289 (60.2)	315 (87.0)	222 (57.8)	312 (44.0)	1138 (58.9)
Primary care	31 (6.5)	15 (4.1)	20 (5.2)	66 (9.3)	132 (6.8)
Social care	18 (3.8)	13 (3.6)	26 (6.5)	59 (8.3)	116 (6.0)
Emergency services	20 (4.2)	3 (0.8)	45 (11.7)	30 (4.2)	98 (5.0)
Education	14 (2.9)	0 (0)	1 (0.2)	9 (1.3)	24 (1.2)

	Site A (n=475)	Site B (n=367)	Site C (n=400)	Site D (n=731)	Total (n=1973)
VCSE	2 (0.4)	0 (0)	13 (3.4)	36 (5.1)	51 (2.6)
Local authority	17 (3.5)	0 (0)	4 (1)	15 (2.1)	36 (1.9)
Other*	84 (17.5)	16 (4.4)	54 (14.1)	182 (25.7)	336 (17.4)
Missing	0% missing	1.4% missing	4% missing	3% missing	2.1% missing

Note: All percentages calculated excluding missing values

*In all sites other than Site D, free text information about job role were available, therefore it was often possible to re-categorise clients from 'Other' to one of the main reported categories included in the table, most commonly to the NHS category. However, this open text response option was not available for Site D, hence a high proportion of 'Other' job roles.

3. Regression tables for the caseness and overall severity analyses

Supplementary Table 3: Summary of logistic regression analyses of PHQ-9 caseness

Predictor	OR	95% CI		p	Interaction p-value
<u>Demographics</u>					
Age	1	0.99	1.01	0.416	0.525
Gender (man vs woman)	1.02	0.77	1.36	0.879	0.744
Gender (identified in another way vs woman)	0.75	0.36	1.62	0.507	-
Ethnicity (ethnic minority vs white)	0.66	0.43	1.03	0.063	0.044
ICU/critical care	1.14	0.81	1.64	0.458	0.466
Clinical vs non-clinical	0.67	0.44	1.01	0.062	0.024
Sexual orientation (identified in another way vs heterosexual)	1.89	0.123	2.94	0.004	0.969
Disability					0.264
	1.71	1.19	2.53	0.005	

Predictor	OR	95% CI		p	Interaction p-value
<i>Impacts of COVID</i>					
COVID illness (home)	1.21	0.97	1.5	0.094	0.266
COVID illness (hospital)	1.32	0.74	2.48	0.364	0.483
COVID family member (home)	1.21	0.96	1.52	0.11	0.228
COVID family member (hospital)	1.06	0.74	1.54	0.763	0.995
Financial loss	1.48	1.14	1.95	0.004	0.489
Undertaking new tasks	1.23	1.01	1.51	0.038	<0.001
Seconded or re-deployed	0.93	0.71	1.23	0.616	0.661
Moved work location	1.22	0.98	1.53	0.076	0.211
Bereavement	1.26	0.97	1.64	0.089	0.242
<i>Pre-pandemic MH concerns</i>					
Yes (vs no)	2.03	1.62	2.53	<0.001	0.085
Unsure (vs no)	1.81	1.37	2.42	0.001	-

Supplementary Table 4: Summary of logistic regression analyses of GAD-7 caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.98	0.97	0.99	<0.001	0.576
Gender (man vs woman)	0.95	0.73	1.25	0.725	0.726

Predictor	OR	95% CI		p	Interaction p-value
Gender (identified in another way vs woman)	0.78	0.37	1.64	0.507	-
Ethnicity (ethnic minority vs white)	1.14	0.74	1.79	0.547	0.432
ICU/critical care	1.15	0.83	1.6	0.406	0.843
Clinical vs non-clinical	0.98	0.67	1.41	0.899	0.689
Sexual orientation (identified in another way vs heterosexual)	1.32	0.92	1.92	0.13	0.477
Disability	1.17	0.85	1.63	0.33	0.230
<i><u>Impacts of COVID</u></i>					
COVID illness (home)	0.9	0.74	1.1	0.311	0.003
COVID illness (hospital)	0.82	0.49	1.38	0.445	0.68
COVID family member (home)	1.13	0.91	1.4	0.272	0.001
COVID family member (hospital)	1.39	0.97	2.01	0.074	0.715
Financial loss	1.28	1	1.64	0.049	0.649
Undertaking new tasks	1.13	0.94	1.37	0.194	0.583
Seconded or re-deployed	0.92	0.71	1.19	0.521	0.494
Moved work location	1.21	0.98	1.49	0.074	0.192
Bereavement	1.38	1.07	1.77	0.012	0.613
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	2.05	1.66	2.53	<0.001	0.399
Unsure (vs no)	1.66	1.28	2.17	0.001	-

Supplementary Table 5: Summary of logistic regression analyses of PTSD caseness based on the PCL-5

Predictor	OR	95% CI	p	Interaction p-value	
<i>Demographics</i>					
Age	1	0.99	1.01	0.927	0.73
Gender (man vs woman)	1.09	0.73	1.65	0.681	0.633
Gender (identified in another way vs woman) *	-	-	-	-	-
Ethnicity (ethnic minority vs white)	1.89	0.93	4.15	0.093	0.296
ICU/critical care	2.23	1.45	3.52	<0.001	0.536
Clinical vs non-clinical	0.92	0.49	1.67	0.781	NA**
Sexual orientation (identified in another way vs heterosexual)	1.59	0.99	2.63	0.062	0.627
Disability	1.79	1.12	2.94	0.018	0.384
<i>Impacts of COVID</i>					
COVID illness (home)	1.00	0.73	1.37	0.998	0.821
COVID illness (hospital)	2.56	1.09	7.02	0.044	0.436
COVID family member (home)	0.98	0.7	1.37	0.898	0.273
COVID family member (hospital)	1.27	0.7	2.38	0.445	0.227
Financial loss	1.72	1.12	2.69	0.015	0.019
Undertaking new tasks	0.97	0.73	1.29	0.826	0.004
Seconded or re-deployed	1.05	0.73	1.52	0.797	0.390

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Predictor	OR	95% CI		p	Interaction p-value
Moved work location	0.98	0.71	1.37	0.928	0.762
Bereavement	1.48	0.97	2.29	0.072	0.030
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	1.95	1.42	2.7	<0.001	0.623
Unsure (vs no)	1.29	0.87	1.91	0.205	-

Note: * This model was not computable due to small numbers ** No interaction was computable as PCL-5 data were available for one site only

Supplementary Table 6: Summary of logistic regression analyses of PTSD caseness based on the ITQ

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.99	0.98	1	0.191	0.923
Gender (man vs woman)	1.17	0.82	1.67	0.381	0.818
Gender (identified in another way vs woman)	1.13	0.46	2.55	0.783	-
Ethnicity (ethnic minority vs white)	1.32	0.74	2.3	0.333	0.263
ICU/critical care	1.44	0.83	2.45	0.184	0.844
Clinical vs non-clinical	1.1	0.69	1.8	0.686	0.239
Sexual orientation (identified in another way vs heterosexual)	1.20	0.70	2.00	0.501	0.211
Disability	1.32	0.84	2.03	0.22	0.522

Predictor	OR	95% CI		p	Interaction p-value
<i>Impacts of COVID</i>					
COVID illness (home)	0.83	0.62	1.09	0.187	0.504
COVID illness (hospital)	1.25	0.6	2.49	0.539	0.121
COVID family member (home)	1.27	0.96	1.67	0.097	0.639
COVID family member (hospital)	1.62	1.06	2.48	0.025	0.596
Financial loss	1.57	1.16	2.13	0.003	0.382
Undertaking new tasks	1.71	1.31	2.25	<0.001	0.713
Seconded or re-deployed	1.39	0.97	1.99	0.07	0.406
Moved work location	1.49	1.13	1.95	0.004	0.043
Bereavement	1.91	1.41	2.58	<0.001	0.314
<i>Pre-pandemic MH concerns</i>					
Yes (vs no)	1.59	1.20	2.11	0.001	0.34
Unsure (vs no)	1.07	0.73	1.55	0.72	-

Supplementary Table 7: - Summary of logistic regression analyses of AUDIT caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	1	0.99	1.01	0.909	0.553

Predictor	OR	95% CI		p	Interaction p-value
Gender (man vs woman)	2.35	1.74	3.16	<0.001	0.291
Gender (identified in another way vs woman)	1.40	0.54	3.21	0.455	-
Ethnicity (ethnic minority vs white)	0.24	0.09	0.51	0.001	0.151
ICU/critical care	1.43	0.98	2.08	0.061	0.009
Clinical vs non-clinical	1.35	0.87	2.16	0.19	0.004
Sexual orientation (identified in another way vs heterosexual)	1.47	0.95	2.22	0.072	0.167
Disability	0.65	0.41	0.98	0.049	0.214
<i><u>Impacts of COVID</u></i>					
COVID illness (home)	1.07	0.83	1.37	0.622	0.77
COVID illness (hospital)	0.2	0.05	0.54	0.006	0.329
COVID family member (home)	1.1	0.84	1.42	0.488	0.476
COVID family member (hospital)	0.74	0.46	1.15	0.2	0.568
Financial loss	1.17	0.87	1.55	0.291	0.807
Undertaking new tasks	1.38	1.09	1.76	0.008	0.627
Seconded or re-deployed	0.93	0.67	1.27	0.648	0.651
Moved work location	0.71	0.55	0.93	0.012	0.943
Bereavement	1.3	0.97	1.73	0.07	0.136
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	1.18	0.90	1.53	0.226	0.018

Predictor	OR	95% CI		p	Interaction p-value
Unsure (vs no)	1.53	1.12	2.09	0.008	-

Supplementary Table 8: Part 2- Summary of logistic regression analyses of WSAS caseness

Predictor	OR	95% CI		p	Interaction p-value
<i>Demographics</i>					
Age	0.99	0.98	1	0.198	0.061
Gender (man vs woman)	1.12	0.81	1.56	0.498	0.498
Gender (identified in another way vs woman)	1.42	0.6	3.88	0.456	-
Ethnicity (ethnic minority vs white)	0.87	0.54	1.45	0.568	0.481
ICU/critical care	0.85	0.59	1.26	0.409	0.674
Clinical vs non-clinical	0.66	0.41	1.03	0.078	0.2
Sexual orientation (identified in another way vs heterosexual)	2.44	1.45	4.35	0.002	0.189
Disability	1.93	1.23	3.15	0.006	0.190
<i>Impacts of COVID</i>					
COVID illness (home)	1.23	0.96	1.59	0.1	0.576
COVID illness (hospital)	1.26	0.66	2.67	0.513	0.882
COVID family member (home)	1.62	1.24	2.14	0.001	0.473
COVID family member (hospital)	1.06	0.71	1.64	0.772	0.628

Predictor	OR	95% CI		p	Interaction p-value
Financial loss	1.59	1.17	2.19	0.004	0.912
Undertaking new tasks	1.13	0.9	1.41	0.295	0.129
Seconded or re-deployed	0.83	0.62	1.13	0.237	0.195
Moved work location	1.06	0.83	1.36	0.643	0.839
Bereavement	1.08	0.81	1.45	0.595	0.173
<i><u>Pre-pandemic MH concerns</u></i>					
Yes (vs no)	2.29	1.77	2.97	<0.001	0.018
Unsure (vs no)	1.71	1.25	2.37	0.001	-

Supplementary Table 9: Part 2 - Summary of proportional odds logistic regression analyses of overall severity across the Hub screening measures

Predictor	OR	95% CI		p	Interaction p-value
<u>Demographics</u>					
Age	0.99	0.98	1.00	0.05	0.91
Gender (man vs woman)	1.07	0.82	1.40	0.62	0.83
Gender (identified in another way vs woman)	1.07	0.52	2.25	0.86	-
Ethnicity (ethnic minority vs white)	0.85	0.56	1.32	0.47	0.19
ICU/critical care	1.28	0.92	1.81	0.15	0.60
Clinical vs non-clinical*	0.81	0.56	1.16	0.26	Not computable

Predictor	OR	95% CI		p	Interaction p-value
Sexual orientation (identified in another way vs heterosexual)	1.75	1.22	2.63	0.004	0.28
Disability	1.70	1.21	2.41	0.003	0.58
<i>Impacts of COVID</i>					
COVID illness (home)	1.18	0.97	1.45	0.11	0.19
COVID illness (hospital)	1.44	0.83	2.61	0.21	0.93
COVID family member (home)	1.31	1.06	1.63	0.01	0.13
COVID family member (hospital)	1.18	0.83	2.61	0.21	0.82
Financial loss	1.84	1.43	2.39	<0.001	0.92
Undertaking new tasks	1.19	0.99	1.44	0.06	0.04
Seconded or re-deployed	1.04	0.81	1.35	0.76	0.42
Moved work location	1.15	0.94	1.41	0.19	0.22
Bereavement	1.25	0.98	1.60	0.07	0.30
<i>Pre-pandemic MH concerns</i>					
Yes vs no	2.11	1.72	2.59	<0.001	0.15
Yes vs unsure	1.43	1.08	1.90	0.01	-

* It was not possible to adjust this analysis for site due to the distribution of the outcome across sites in the subgroup of NHS workers. Attempting to do so resulted in non-convergence of the model.