

Mental health in a diverse sample of healthcare workers during the COVID-19 pandemic: cross-sectional analysis of the UK-REACH study

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The lead authors affirm that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

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The funding source was not involved in study design, data collection or analysis, interpretation, or writing of the report.

Data sharing

Deidentified participant data are available via a system of managed access, to access data or samples produced by the UK-REACH study please contact uk-reach@leicester.ac.uk to discuss your request.

The protocol for the UK-REACH longitudinal cohort study is available at:

<http://dx.doi.org/10.1136/bmjopen-2021-050647>, and a Data Dictionary of the baseline

questionnaire data is available at: <https://uk-reach.org/main/data-dictionary/>.

Competing interests

SC is Deputy Medical Director of the General Medical Council, UK Honorary Professor, University of Leicester. MDT receives funding from GSK for collaborative research projects outside of the submitted work. KK is Director of the University of Leicester Centre for Black Minority Ethnic Health, Trustee of the South Asian Health Foundation and Chair of the Ethnicity Subgroup of the UK Government Scientific Advisory Group for Emergencies (SAGE). MP reports grants from Sanofi, grants and personal fees from Gilead Sciences and personal fees from QIAGEN, outside the submitted work.

Summary box

What is already known on this topic

- The pandemic is placing healthcare workers under immense pressure, and there is currently a mental health crisis amongst NHS staff
- Ethnic inequities in health outcomes are driven by structural discrimination, which occurs inside and outside the workplace
- Investigating ethnic inequities in the mental health of healthcare workers requires large diverse studies, of which few exist

What this study adds

- In UK-REACH (N=11,695), ethnic minority staff had higher odds of Post-Traumatic Stress Disorder symptoms; we report many other factors associated with mental-ill health, including those experienced disproportionately by ethnic minority staff, such as workplace discrimination, contact with more patients with COVID-19, and bereavement due to COVID-19
- These findings underline the moral and practical need to care for staff mental health and wellbeing, which includes tackling structural inequities in the workplace; improving staff mental health may also reduce workforce understaffing due to absence and attrition

Abstract

Objectives: To investigate how ethnicity and other sociodemographic, work, and physical health factors are related to mental health in UK healthcare and ancillary workers (HCWs), and how structural inequities in these factors may contribute to differences in mental health by ethnicity.

Design: Cross-sectional analysis of baseline data from the UK-REACH national cohort study.

Setting: HCWs across UK healthcare settings.

Participants: 11,695 HCWs working between December 2020-March 2021.

Main outcome measures: Anxiety or depression symptoms (4-item Patient Health Questionnaire, cut-off ≥ 3), and Post-Traumatic Stress Disorder (PTSD) symptoms (3-item civilian PTSD Checklist, cut-off ≥ 5).

Results: Asian, Black, Mixed/multiple and Other ethnic groups had greater odds of PTSD than the White ethnic group. Differences in anxiety/depression were less pronounced. Younger, female HCWs, and those who were not doctors had increased odds of symptoms of both PTSD and anxiety/depression. Ethnic minority HCWs were more likely to experience the following work factors that were also associated with mental ill-health: workplace discrimination, feeling insecure in raising workplace concerns, seeing more patients with COVID-19, reporting lack of access to personal protective equipment (PPE), and working longer hours and night shifts. Ethnic minority HCWs were also more likely to live in a deprived area and have experienced bereavement due to COVID-19. After adjusting for sociodemographic and work factors, ethnic differences in PTSD were less pronounced and ethnic minority HCWs had lower odds of anxiety/depression compared to White HCWs.

Conclusions: Ethnic minority HCWs were more likely to experience PTSD and disproportionately experienced work and sociodemographic factors associated with PTSD, anxiety and depression. These findings could help inform future work to develop workplace strategies to safeguard HCWs' mental health. This will only be possible with adequate investment in staff recruitment and retention, alongside concerted efforts to address inequities due to structural discrimination.

Introduction

The COVID-19 pandemic is a time of immense pressure for healthcare workers (HCWs) in both clinical and ancillary roles.

In early 2020, the threat of the impending pandemic escalated rapidly into many critically unwell patients in hospitals,¹ major increases in demand in the community,² longer working hours, constantly evolving restrictions, and changes to working practices and services.³ These pressures are alongside the risk of HCWs' own COVID-19 illness or death in addition to that of their patients, colleagues and family and friends, and the possibility of infecting others, compounded by shortages in personal protective equipment (PPE)⁴. HCWs have found their personal moral codes threatened or violated, by being constrained in their ability to take action(s) that they consider ethically correct, for example due to resource pressures, or institutional culture.^{5,6} Many of these complex factors have been shown to be associated with higher rates of anxiety, depression and post-traumatic stress disorders among HCWs both in the UK and worldwide during the pandemic.^{7,8}

The work stressors borne by HCWs are in addition to those experienced at the population level,⁹ such as caring responsibilities, financial difficulties, pre-existing health needs (which may have led vulnerable HCWs to not be able to work, or to work remotely¹⁰), and reduction in social support due to lockdown restrictions.

Ethnic minority communities and HCWs have experienced higher rates of infection and mortality from COVID-19.¹¹⁻¹⁴ In addition, many NHS healthcare workers from ethnic minority groups have family and friends overseas who will have been impacted by pandemic waves globally. Adjusting statistically for geographical, socio-demographic, and pre-pandemic health factors substantially reduces differences in mortality between most ethnic minority groups and the White population, which may suggest that structural factors partly mediate such differences.^{13,15} In the NHS and broader society, structural inequities by ethnicity are prevalent.^{16,17} The 2020 NHS staff survey reported that more ethnic minority HCWs than White HCWs experienced workplace harassment, bullying or abuse in 2020, and the gap widened from 2017-2020¹⁸. The relationship between these experiences and poor mental health are well-known.¹⁹ Indirect measures of inequity at work, e.g. both quantitative (workload) and qualitative (roles at work, trust in employer), are less studied, but are described as work predictors for common mental health problems, alongside external factors.²⁰ ²¹ We therefore hypothesised that ethnic inequities in stressful conditions at work and factors outside of work could contribute to differences in mental health between ethnic groups.

We used baseline questionnaire data from the United Kingdom Research study into Ethnicity and COVID-19 outcomes in Healthcare workers (UK-REACH) to investigate three research questions: i) what are the associations between ethnicity, other sociodemographic, work and physical health factors and symptoms of anxiety/depression and Post-Traumatic Stress Disorder (PTSD)? ii) what evidence is there of ethnic inequities in these factors? and iii) how does adjusting for these factors alter the association between ethnicity and mental health?

Methods

Study population

UK-REACH includes six work streams that aim to examine the impact of the COVID-19 pandemic on HCWs, and to explore potential disparities by ethnicity.

The current cross-sectional study uses baseline questionnaire data from participants in the UK-REACH prospective cohort study. Details of the cohort study design and participant recruitment are given in the study protocol,²² and details of the questionnaire are available at <https://www.uk-reach.org/data-dictionary>.

Briefly, clinical and ancillary HCWs aged 16 or over, living in the four nations of the UK, and from diverse ethnic backgrounds were invited to participate, either by one of seven healthcare professional regulators, a participating NHS trust or by broader study advertisement. Participants who gave their informed consent to join the study were invited to complete the baseline questionnaire online (data collected between 4th December 2020 - 8th March 2021).

Outcome measures

The primary outcomes were symptoms of anxiety or depression (anxiety/depression) combined due to their comorbid nature, and PTSD, as measured by screening tools. Anxiety and depression symptoms were measured using the Generalised Anxiety Disorder 2-item scale (GAD-2) and the Patient Health Questionnaire-2 scale (PHQ-2), respectively. Scores were combined (as the PHQ-4), with a score ≥ 3 used to derive a pooled outcome of potential anxiety or depression.²³ Symptoms of PTSD were evaluated using a three-item version of the PTSD Checklist—civilian version (PCL-C), with a score ≥ 5 used to define a dichotomised outcome.²⁴

Predictor variables

We studied multiple factors related to participants' lives, both at work and outside of work, for their association with either of the mental health outcomes. These variables were chosen *a priori*, because of published or hypothesised associations with worse mental health. For a full list and details of how individual variables were measured and coded, see **Supplementary Text**.

Key demographic variables studied were ethnicity, age and sex. Self-reported ethnicity was categorised into five broad groups to maximise power for statistical analysis, consistent with categorisation used for the 2011 UK Census²⁵ (White, Mixed/multiple ethnic groups, Asian/Asian British, Black/African/Caribbean/Black British, Other ethnic group, hereafter abbreviated to 'White', 'Mixed/multiple', 'Asian', 'Black' and 'Other'). In this paper, we use the term ethnic minorities to describe participants belonging to the 'Mixed/multiple', 'Asian', 'Black' and 'Other' groups.

Other socioeconomic factors studied were: index of multiple deprivation (IMD) decile,²⁶ being born in the UK, the number of other individuals in the participant's household, whether participants live with children, whether participants live with adults ≥ 65 years, and bereavement due to COVID-19.

Physical health factors studied were: number of physical long-term conditions, SARS-CoV-2 infection status, frequency of alcohol consumption, smoking status, and physical activity (measured by the GP Physical Activity Index).²⁷

Working factors studied were: job role (doctor or medical support; nurse, nursing associate or midwife; allied health professional; dental; admin, estates or other), type of workplace (e.g. intensive care unit), COVID-19 redeployment status, whether or not a participant had experienced discrimination at work, whether a participant would feel secure to raise concerns at work about unsafe clinical practice, and whether a participant would trust their organisation to address their

concerns. We also included variables measuring day-to-day characteristics of participants' job role, including degree of patient contact per week (numbers of patients with COVID-19, and number without COVID-19), weekly working hours, frequency of night working, and access to appropriate PPE.

Statistical analysis

Given the focus of the UK-REACH study on understanding disparities in outcomes by ethnicity, only individuals with complete data for ethnicity and at least one of the mental health outcome measures of anxiety/depression (GAD-2, PHQ-2) or PTSD (PCL-C) scales were retained for this analysis. For the main analysis, the sample was further restricted to those HCWs who reported that they were working at the time of baseline questionnaire completion, since the aim was to study the association between working factors and mental health.

To account for missing data for the remaining variables, we performed multiple imputation and used Rubin's rules²⁸ to combine estimates and standard errors from ten imputations to produce a final set of results. Due to lack of comparability of IMD across countries,²⁶ we opted to impute an English IMD entry for those outside of England rather than use Welsh, Scottish and Northern Irish IMD values.

We report descriptive statistics for predictor variables as median and IQR for continuous variables, and as percentages for categorical variables.

Association of sociodemographic, physical health and work factors with anxiety/depression and PTSD

We used logistic regression to calculate associations between ethnicity and other sociodemographic factors, physical health and work factors with each dichotomised mental health outcome. We present both univariable associations, and associations adjusted for age, sex, ethnicity and job role.

Associations of ethnicity with sociodemographic, physical health and work factors

To explore evidence of inequities in sociodemographic, physical health and work factors by ethnicity, we performed regression analyses, also adjusted for age, sex and job role, to estimate the associations between ethnicity and work/non-work factors (using linear, logistic and ordinal logistic regression for continuous, binary, and ordered categorical outcomes respectively).

Serial adjustment of association between ethnicity and mental health

We further adjusted associations between ethnicity and mental health outcomes for factors in and outside of work, to explore whether the association attenuated when adjusting for possible mediators. After initially adjusting for variables hypothesised as confounders (model 1), we further adjusted for social (model 2), health (model 3) and work factors (model 4).

Sensitivity Analyses

To assess the effect of only including individuals who were working at time of questionnaire completion, we recalculated the associations between non-work factors and mental health after additionally including individuals who were not working.

We included "date of consent" (month/year) in the model as an unordered categorical variable, as a proxy for date of questionnaire completion, to explore its effect on original estimates in the main analysis sample, and its association with mental health outcomes.

Since multiple imputation can introduce bias when the reason for why data are missing is unclear, we re-calculated associations between work/non-work factors and mental health after restricting to complete data for confounders for each exposure. We also re-calculated the serially adjusted

analysis for associations between ethnicity and mental health, restricting to individuals with complete data for *all* covariates.

Reporting of results

We do not report results corrected for multiple testing, since this approach emphasises the inappropriate dichotomisation of p-values by arbitrary thresholds. This would also be over-conservative in our analysis due to correlation between variables. Instead, we report the overall pattern of results, reporting exact p-values, and use estimates of effect size and 95% confidence intervals to assess the strength of associations, as recommended previously.^{29,30,31}

All analyses were undertaken in Stata 16.³²

Ethical approval and engagement

The study was approved by the Health Research Authority (Brighton and Sussex Research Ethics Committee; ethics reference: 20/HRA/4718). All participants gave their informed consent via an online consent process.

Patient and Public Involvement

UK-REACH includes a Professional Expert Panel of HCWs from a range of ethnic backgrounds, occupations, and genders, as well as a Stakeholder Advisory Group with representatives from national and local organisations (see study protocol).²²

Results

Description of analysed cohort

Of 17,891 individuals recruited to UK-REACH, 15,119 individuals responded to the baseline questionnaire, of whom 12,282 had complete data for ethnicity and the mental health outcomes. Of these, 11,695 were working at the time of baseline questionnaire completion, and these individuals formed the main analysis sample (see **Supplementary Figure 1** for a flowchart describing the sample selection, from recruitment onwards).

Table 1 presents descriptive statistics for the main analysis sample. Around three-quarters were female, with a median age of 45 years (IQR 34-54). Approximately 30% were from ethnic minority groups (19.1%, 4.2%, 4.2% and 2.1% from Asian, Black, Mixed/multiple and Other ethnic groups, respectively). In terms of professional role, 42% of the cohort were from allied health professions, including pharmacists, 23% were doctors or in medical support roles; 20% were nurses, nursing associates or midwives; 6% were dentists or in other dental roles; 5% were in admin, estates or other roles; and 4% had a missing job role.

Anxiety/depression and PTSD symptoms, and associations with sociodemographic, physical health and work variables

Approximately 23% (N=2,694) of the sample met the screening criteria for possible anxiety/depression, and 14% (N=1,638) for possible PTSD, and 10% (N=1,124) had evidence of both.

Table 2 shows univariable and multivariable logistic regression results for the associations between ethnicity and other sociodemographic factors, physical health and work factors with both anxiety/depression and PTSD symptoms. Multivariable results are adjusted for age, sex, ethnicity and job role.

In multivariable analyses, participants belonging to the 'Other' ethnic group had higher odds of anxiety/depression compared to the White ethnic group (adjusted odds ratio (aOR) 1.33 [95%CI 0.98,1.80]). Odds ratios for the Asian (aOR 0.94 [95%CI 0.83,1.07]), Black (aOR 0.82 [95%CI 0.65,1.04]) and Mixed/multiple groups (aOR 0.95 [95%CI 0.76,1.18]) were slightly below 1. However, confidence intervals for these estimates were imprecise.

Asian (aOR 1.55 [95%CI 1.34,1.78]), Black (aOR 1.32 [95%CI 1.01,1.71]), Mixed/multiple (aOR 1.11 [95%CI 0.85,1.46]) and Other ethnic groups (aOR 1.83 [95%CI 1.29,2.60]) all had increased odds of PTSD compared to the White ethnic group. This association was particularly strong in Asian HCWs and HCWs belonging to the 'Other' ethnic group, however the latter was more imprecisely estimated.

Anxiety/depression and PTSD symptoms tended to share common predictors in our analysis. Higher odds were observed for both females and younger individuals, and all other job roles compared to doctors (with highest odds observed for nurses, nursing associates and midwives). Individuals living in areas of greater deprivation reported worse mental health, as did those who had been bereaved due to COVID-19 (own COVID-19 illness was not associated). Physical health factors were associated with mental health: participants who had ever smoked, and participants with long-term conditions reported worse mental health, and there was an apparent protective association with moderate or high levels of physical activity, and with moderate alcohol consumption. Higher levels of alcohol consumption were not protective.

Experiencing discrimination at work was one of the factors that showed the strongest association with poorer mental health (anxiety/depression: aOR 2.12 [95%CI 1.92,2.33]; PTSD: aOR 2.64 [95%CI 2.35,2.95]). Other strong associations were not feeling secure in raising concerns at work (anxiety/depression: aOR 2.04 [95%CI 1.81,2.27]; PTSD: aOR 2.08 [95%CI 1.81,2.38]), and not trusting one's employer to address concerns (anxiety/depression: aOR 1.89 [95%CI 1.72,2.08]; PTSD: aOR 1.89 [95%CI 1.67,2.08]). Other work-related factors associated with both anxiety/depression and PTSD included working longer hours and reporting inadequate access to appropriate PPE. There was a dose-response association between contact with greater numbers of COVID-19 patients per week with both mental health measures, but seeing more patients without COVID-19 was not associated with increased odds.

Some predictor variables were more specific to one mental health outcome than the other: attributing at least some importance to religion was associated with higher odds of PTSD, but not with anxiety/depression. Living with a greater number of people was strongly associated with lower odds of anxiety/depression, but less strongly associated with PTSD.

Analyses were qualitatively similar when using non-imputed data (complete for confounders, **Supplementary Table 1**) and when including date of consent in the model (**Supplementary Table 2**). Participants consenting in January-March 2021 (compared to December 2020) generally had higher odds of poor mental health. Conclusions were qualitatively similar when additionally including participants who were not working at the time of baseline questionnaire completion (**Supplementary Table 3**).

Associations of sociodemographic, physical health and work variables with ethnicity

Table 3 presents associations between ethnicity and sociodemographic, physical health, and work factors, adjusted for age, sex and job role. These findings demonstrate the marked inequities by ethnicity across many factors associated with worse mental health.

We found more ethnic minority HCWs were living in the most deprived areas than White HCWs. Ethnic minority HCWs had twice to three times the odds of experiencing discrimination at work compared to White HCWs. Black HCWs worked longer hours, and were more likely to work night shifts (for HCWs in the Black or Other ethnic groups), have more contact with patients with COVID-19 (for HCWs in the Asian, Black or Other ethnic groups) and report reduced access to appropriate PPE. Ethnic minority HCWs were also less likely to feel secure raising concerns at work, or to have trust in their organisation to address these concerns. Participants from all ethnic minority groups were more likely than the White ethnic group to have been bereaved due to COVID-19, and Black HCWs were more likely to have had COVID-19 themselves. Protective associations were observed for some predictor variables in relation to mental health: overall, the odds of alcohol consumption were markedly lower in all HCWs from ethnic minority groups, and odds of smoking were lower in Asian and Black participants.

Serial adjustment of associations between ethnicity and mental health

Serially adjusting for sociodemographic, physical health and work factors (**Figure 1, Supplementary Table 4**), attenuated the higher odds of PTSD for ethnic minority HCWs. After adjustment, the associations with anxiety/depression moved in a protective direction, with Asian and Black HCWs having reduced odds for these measures compared to White HCWs. Point estimates changed most after adjusting for the sociodemographic and work factors studied. Since this change in the pattern of results could potentially be driven by structural inequities in factors related to mental health that differ by ethnicity, ethnicity estimates for models 2-4 should not be interpreted as total effects, but as the effects after adjusting out inequities in these factors. Sensitivity analyses restricting to complete cases (N=6,278) showed similar results (**Supplementary Table 5**).

Discussion

In an analysis of almost 12,000 HCWs working in the UK, 1 in 4 met screening criteria for anxiety or depression, and 1 in 7 for PTSD. Odds of PTSD symptoms were higher in Asian, Black, Mixed/multiple and Other ethnic groups, compared to the White ethnic group. Differences in anxiety/depression symptoms by ethnicity were generally less pronounced, but suggested higher odds for the Other ethnic group and slightly lower odds for HCWs of Asian, Black and Mixed/multiple ethnicity compared to White HCWs.

Ethnic minority HCWs experienced disproportionately more factors associated with poorer mental health, including living in more deprived areas, workplace discrimination, working longer hours and working night shifts, seeing more COVID-19 patients, reporting reduced access to appropriate PPE, and being bereaved due to COVID-19. Younger, female participants, and those who were not doctors were also more likely to report anxiety/depression and PTSD symptoms. Serial adjustment for sociodemographic and work factors suggested that differences in mental health by ethnicity could be driven by structural inequities in these factors.

To our knowledge, this is one of the largest studies of mental health in HCWs to date. The overall sample size, and diversity of UK-REACH (~30% from minority ethnic groups) enabled direct

comparison of mental health symptoms by ethnicity.²² The baseline questionnaire collected data on many work, sociodemographic, physical and mental health factors, and follow-up questionnaires will enable the study of longitudinal changes in mental health.

Our study has limitations: in all cross-sectional studies, associations may be bidirectional, or due to reverse causation, e.g. smoking and mental health,³³ religiosity and PTSD³⁴. Moreover, although the breadth of UK-REACH data permitted adjustment for hypothesised confounders, residual confounding (due to missing data or measurement error) is possible in all observational studies.

Selection bias may also have affected our conclusions. Eligible individuals with worse mental health may be less likely to join a study³⁵ and despite being similar to the NHS workforce in terms of age and sex,³⁶ the current sample includes more clinical healthcare professionals,³⁶ fewer ancillary workers, fewer participants from White and Black ethnic groups, and more from Asian and Mixed/multiple ethnic groups.³⁷ Estimating prevalence of anxiety/depression and PTSD is difficult when using a screening tool and cut-offs to define caseness. Epidemiological studies may provide overoptimistic estimates if participants generally underreport symptoms, and biased associations may result from systematic variation in disclosure of symptom severity by levels or categories of a risk factor³⁸. For example, under-reporting of symptoms by men has been hypothesised as a reason for why women may appear more susceptible to mental ill-health.³⁹ Two studies of diverse participants reported that the PHQ-9 scale (from which the PHQ-2 is derived) performed similarly across ethnicities, suggesting that inequalities in symptoms were not due to differential performance of the scale by ethnicity.^{40 41}

We used the five ONS ethnicity categories (rather than 18 ONS categories),²⁵ due to small numbers in some groups. This limits our ability to capture differences in mental health for more granular categorisations of ethnicity. The ethnic categorisations used and quantitative associations presented cannot fully capture the nuance of participants' lived experiences; however, complementary qualitative work in UK-REACH contextualises HCWs' individual experiences, and also highlights the role of bereavement due to COVID-19, increased clinical workloads (including the traumatic and exhausting nature of treating high volumes of sick patients), and fear of contracting or transmitting infection (including PPE access) in contributing to mental ill-health in HCWs.²¹

Our finding that anxiety/depression symptoms were only weakly associated with ethnicity is similar to another study of HCW mental health during the pandemic;⁵ that study also found no strong associations between ethnicity and PTSD, which may reflect its smaller sample size and lower proportion of ethnic minority participants. However, our findings are similar to the results of the NHS Staff survey 2019,⁴² in which *lower* levels of pre-pandemic stress were generally reported by participants from Asian, Black, Chinese, and Mixed ethnic groups. Whilst stress is not directly comparable to our primary outcomes, before adjustment for age, sex, ethnicity and job role, we observed slightly lower odds of anxiety/depression for Asian and Black HCWs. This association weakened on adjustment, which may reflect that ethnic minority HCWs in UK-REACH are younger, and more likely to be doctors (younger age and being a doctor were associated with lower odds of mental ill-health in our analysis). Associations between mental health, age, sex and job role observed in our study align with other smaller quantitative studies in the UK,⁵ Kenya⁴³ and the USA⁴⁴ (the latter also confirmed associations with COVID-19-related workload, and overall working hours).

As in UK-REACH, smaller studies of HCWs in the UK have found strong associations between better mental health and feeling able to confide in one's employer⁴⁵ and between experiencing discrimination at work and probable anxiety/depression.¹⁹ The 2020 NHS Workforce Race Equality Standard (WRES) report¹⁶ found that experiencing discrimination was more common in HCWs from a

minority ethnic background, and this association was similar in UK-REACH: all ethnic minority groups reported 2-3 times higher odds of workplace discrimination compared to White HCWs, with highest odds for Black HCWs. This highlights the need for preventative strategies and training to tackle discrimination in recruitment, retention, and performance appraisal, and the development of an inclusive culture, with clear policies for dealing with bullying and harassment (from staff, patients and public), supported by legislation¹⁶. As noted by the 2020 NHS WRES report, the pandemic has not created inequity, but has “thrown it into sharp relief”.¹⁶ We suggest the same is true for many other workplace stressors associated with mental ill-health, experienced disproportionately by ethnic minority HCWs. Furthermore, multiple areas of inequity or marginalisation may intersect.⁴⁶ Some factors such as bereavement, both personal and collective, have been exacerbated by the pandemic.⁴⁷ This underlines the importance of employers being aware of communities most affected, and of compassion and flexibility (e.g. via provision of culturally sensitive bereavement support⁴⁸) to all staff who have lived through traumatic experiences,⁴⁹ inside and outside of work. The National Institute for Clinical Excellence (NICE) recognises being a HCW, exposure to a traumatic event, multiple life stressors, and social disadvantage as risk factors for PTSD.⁵⁰ This would be consistent with our findings that HCWs’ experiencing intersecting stressors at work and in their home lives are more likely to have PTSD symptoms. Attenuation of associations between ethnicity and PTSD observed after adjusting for multiple stressors may help evaluate the magnitude of disparity in mental health by ethnicity that would remain if these intermediate or downstream factors were intervened upon. Multiple agencies have underlined the value of considering specialist trauma services designed to support other professions (e.g. the military) when designing services for HCWs.⁵¹ Any workplace support service must be accompanied by truly protected time for all staff (working different shift patterns) to utilise them.

Although cross-sectional studies cannot infer causality, understanding associations between workplace factors and poor mental health may inform future work to develop proactive and reactive strategies for safeguarding the mental health of ethnic minority HCWs and the healthcare workforce as a whole. Multiple factors associated with worse mental health in HCWs were experienced disproportionately by ethnic minority HCWs. Future work will focus on determining the longitudinal impact of risk factors on mental health using follow-up questionnaires in UK-REACH, and on analysing other hypothesised risk factors not recorded at baseline, such as moral injury and burnout.⁶

There is a moral imperative of caring for HCWs’ wellbeing both during the COVID-19 pandemic and beyond, which includes tackling structural inequities at work; predictions of workforce attrition also underline the practical imperative of doing so.⁵² Prevailing discourses of being ‘at war’ with COVID-19, and the narrative of heroism, have been criticised as dehumanising, and silencing of HCWs’ concerns about working conditions and mental health, thus disenfranchising their collective anger, grief⁵³ and exhaustion.⁵² Listening to, and learning from the lived experiences of the diverse healthcare workforce contending with extraordinarily challenging working conditions is crucial to inform the development of compassionate, culturally sensitive⁴⁸ workplace policies to support HCW wellbeing and mental health. However, considering the pressures on the entire workforce, policymakers must acknowledge that sustainable improvements in staff wellbeing will only be possible alongside investment in NHS recruitment, retention and fair remuneration, to ensure adequate staffing.⁵⁴ Together with concerted efforts by employers to address workplace inequity/discrimination, such strategies may help improve working conditions and HCW mental health and wellbeing.

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Tables and Figures

Table 1. Descriptive of variables and risk factors for main analysis sample of 11,695 individuals.

Variable	N (%)
Anxiety/Depression (PHQ-4 ≥3)	Score ≥3
	Score <3
PTSD (three-item PCL-C ≥5)	Score ≥5
	Score <5
Ethnicity	White
	Asian/Asian British
	Black/African/Caribbean/Black British
	Mixed/multiple ethnic groups
	Other ethnic group
Sex	Male
	Female
	Missing
Age	Median (IQR) (N non-missing)
Job	Doctors and medical support
	Nurses, Nursing Associates, Midwives
	Allied Health Professionals and Pharmacists
	Dental
	Admin/estates/other
	Missing
Migration status	Not born in UK
	Born in UK
	Missing
Index of Multiple deprivation	1 – Most deprived
	2
	3
	4
	5
	6
	7
	8
	9
	10 – Least deprived
	Missing
Household size	Median (IQR) (N non-missing)
Religiosity	Not at all important
	Fairly important
	Very important
	Extremely important
	Missing
Living with children	Does not live with children 18 years or younger
	Lives with children 18 years or younger
	Missing
Living with adults 65+	Does not live with individuals 65 years or over
	Lives with individuals 65 years or over
	Missing
Bereavement due to COVID-19	Does not know someone who died
	Knows someone who died
	Missing
Long-term conditions	0
	1
	2+
	Missing
SARS-CoV-2 infection	No SARS-CoV-2 infection
	SARS-CoV-2 infection
	Missing
Alcohol frequency	Never
	Monthly or less
	2-4 times per month
	2-3 times per week
	4+ times per week
	Missing

Variable		N (%)
Smoking status	Never-smoker	8,437 (72.1)
	Ex-smoker	2,570 (22.0)
	Current smoker	579 (5.0)
	Missing	109 (0.9)
Physical Activity Index (PAI)	Inactive	2,279 (19.5)
	Moderately inactive	2,508 (21.4)
	Moderately active	3,071 (26.3)
	Active	3,224 (27.6)
Discrimination at work	Missing	613 (5.2)
	Not discriminated against at work	7,625 (65.2)
	Discriminated against at work	3,227 (27.6)
	Missing	843 (7.2)
Redeployment	Not redeployed	8,133 (69.5)
	Redeployed	2,064 (17.6)
	Not working	1,439 (12.3)
	Missing	59 (0.5)
Job areas (participants could select multiple areas)	Ambulance	441 (3.8)
	Community clinical	3197 (27.3)
	Community non-clinical	681 (5.8)
	Emergency department	937 (8.0)
	Intensive care	752 (6.4)
	Inpatient setting	2801 (24.0)
	Outpatient	2273 (19.4)
	Public / communal setting	286 (2.4)
	Mobile across areas	352 (3.0)
	Prison	62 (0.5)
	Other clinical setting	1683 (14.4)
	Nursing or care home	273 (2.3)
	Psychiatric hospital / inpatient unit	293 (2.5)
	At home	1831 (15.7)
Secure about raising concerns related to clinical practice	University	273 (2.3)
	Missing	276 (2.4)
	Not secure about raising concerns	1,713 (14.6)
	Secure in raising concerns	9,621 (82.3)
Trusts in organisation to address concerns related to clinical practice	Missing	361 (3.1)
	Does not trust organisation	3,294 (28.2)
	Trusts organisation	8,120 (69.4)
	Missing	281 (2.4)
COVID-19 patient contact per week	0	7,200 (61.6)
	1-5	854 (7.3)
	6-20	2,150 (18.4)
	21-50	909 (7.8)
	51+	362 (3.1)
	Missing	220 (1.9)
Non-COVID-19 patient contact per week	0	1,506 (12.9)
	1-5	625 (5.3)
	6-20	2,624 (22.4)
	21-50	3,254 (27.8)
	51+	3,425 (29.3)
	Missing	261 (2.2)
Current working hours per week	Median (IQR)	37.0 (30.0, 40.0)
	(N non-missing)	(n=11,566)
Currently working at night	No	8,443 (72.2)
	Yes	2,830 (24.2)
	Missing	422 (3.6)
Access to appropriate PPE	Not applicable or all the time	9,943 (85.0)
	Some or most of the time	1,634 (14.0)
	Rarely or not at all	89 (0.8)
	Missing	29 (0.2)

Table 2. Univariable and adjusted associations (adjusted for age, sex, ethnicity and job role) for Anxiety/Depression and PTSD symptom measures.

Variable	Anxiety/Depression symptoms (PHQ-4 ≥3)				PTSD symptoms (PCL-C ≥5)			
	Univariable		Adjusted (Age, Sex, Ethnicity, Job role)		Univariable		Adjusted (Age, Sex, Ethnicity, Job role)	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Ethnicity								
White	ref		ref		ref		ref	
Asian	0.85 (0.76,0.95)	0.005	0.94 (0.83,1.07)	0.351	1.21 (1.07,1.38)	0.004	1.55 (1.34,1.78)	2.13E-09
Black	0.76 (0.60,0.96)	0.019	0.82 (0.65,1.04)	0.095	1.13 (0.87,1.46)	0.355	1.32 (1.01,1.71)	0.039
Mixed	0.97 (0.78,1.20)	0.787	0.95 (0.76,1.18)	0.618	1.03 (0.79,1.34)	0.831	1.11 (0.85,1.46)	0.431
Other	1.09 (0.81,1.46)	0.577	1.33 (0.98,1.80)	0.070	1.34 (0.95,1.88)	0.092	1.83 (1.29,2.60)	0.001
Sex								
Male	ref		ref		ref		ref	
Female	1.59 (1.43,1.77)	<1E-10	1.3 (1.16,1.46)	8.6E-06	1.63 (1.43,1.87)	<1E-10	1.41 (1.22,1.63)	3.2E-06
Age (per decade)	0.69 (0.67,0.72)	<1E-10	0.68 (0.66,0.71)	<1E-10	0.79 (0.76,0.83)	<1E-10	0.79 (0.75,0.83)	<1E-10
Job								
Doctors and medical support	ref		ref		ref		ref	
Nurses, NAs, Midwives	1.84 (1.61,2.11)	<1E-10	1.87 (1.61,2.18)	<1E-10	2.14 (1.82,2.52)	<1E-10	2.51 (2.09,3.01)	<1E-10
Allied Health Professionals and pharmacists	1.47 (1.30,1.66)	<1E-10	1.31 (1.14,1.49)	7.6E-05	1.43 (1.23,1.67)	<1E-10	1.52 (1.29,1.79)	5.9E-07
Dental	1.65 (1.36,2.01)	<1E-10	1.46 (1.20,1.79)	0.0002	1.77 (1.39,2.25)	<1E-10	1.78 (1.40,2.27)	3.5E-06
Admin/estates/other	1.47 (1.19,1.81)	0.00031	1.36 (1.10,1.70)	0.005	1.52 (1.17,1.96)	0.002	1.7 (1.30,2.21)	0.0001
Migration status								
Not born in UK	ref		ref		ref		ref	
Born in UK	1.1 (1.00,1.21)	0.061	0.96 (0.85,1.08)	0.482	0.9 (0.80,1.01)	0.069	0.9 (0.78,1.03)	0.133
Index of Multiple Deprivation	0.93 (0.91,0.95)	<1E-10	0.96 (0.94,0.98)	3.8E-05	0.92 (0.90,0.94)	<1E-10	0.94 (0.92,0.96)	5.3E-07
Household size	0.93 (0.90,0.96)	0.00001	0.93 (0.90,0.96)	2.1E-05	0.96 (0.92,1.00)	0.056	0.95 (0.91,0.99)	0.015
Religiosity								
Not at all important	ref		ref		ref		ref	
Fairly important	0.88 (0.79,0.99)	0.028	0.99 (0.88,1.11)	0.872	1.19 (1.04,1.35)	0.012	1.21 (1.05,1.39)	0.007
Very important	0.93 (0.80,1.08)	0.329	1.1 (0.94,1.30)	0.229	1.35 (1.14,1.60)	0.001	1.39 (1.16,1.67)	0.0003
Extremely important	0.81 (0.70,0.94)	0.005	0.91 (0.77,1.07)	0.246	1.23 (1.03,1.46)	0.019	1.2 (0.99,1.44)	0.061
Living with children								
Does not live with children	ref		ref		ref		ref	
Lives with children	0.89 (0.81,0.97)	0.008	0.89 (0.81,0.98)	0.014	0.98 (0.88,1.09)	0.647	0.97 (0.87,1.09)	0.646
Living with adults 65+								
Does not live with adults 65+	ref		ref		ref		ref	
Lives with adults 65+	0.64 (0.54,0.77)	<1E-10	0.87 (0.73,1.05)	0.153	0.85 (0.69,1.05)	0.123	0.98 (0.79,1.22)	0.847

	Anxiety/Depression symptoms (PHQ-4 ≥3)				PTSD symptoms (PCL-C ≥5)			
	Univariable		Adjusted (Age, Sex, Ethnicity, Job role)		Univariable		Adjusted (Age, Sex, Ethnicity, Job role)	
Bereavement due to COVID-19								
Does not know someone who died	ref		ref		ref		ref	
Knows someone who died	1.18 (1.08,1.29)	0.0001	1.29 (1.18, 1.42)	2.6E-08	1.48 (1.33,1.64)	<1E-10	1.49 (1.34,1.67)	<1E-10
Long-term conditions	1.16 (1.07,1.26)	0.0004	1.31 (1.20, 1.42)	2.2E-09	1.25 (1.13,1.38)	<1E-10	1.34 (1.21,1.48)	2.6E-08
SARS-CoV-2 infection								
No SARS-CoV-2 infection	ref		ref		ref		ref	
SARS-CoV-2 infection	1.06 (0.95,1.17)	0.306	0.97 (0.87, 1.07)	0.518	1.06 (0.93,1.20)	0.390	0.99 (0.87,1.12)	0.821
Alcohol frequency								
Never	ref		ref		ref		ref	
Monthly or less	1.09 (0.95,1.25)	0.210	0.95 (0.82, 1.10)	0.489	0.99 (0.85,1.16)	0.917	0.96 (0.81,1.13)	0.601
2-4 times per month	0.94 (0.82,1.08)	0.395	0.81 (0.69,0.94)	0.005	0.77 (0.65,0.91)	0.002	0.78 (0.65,0.93)	0.005
2-3 times per week	0.75 (0.66,0.87)	0.0001	0.76 (0.65,0.89)	0.001	0.59 (0.50,0.70)	<1E-10	0.68 (0.57,0.82)	4.5E-05
4+ times per week	0.91 (0.77,1.08)	0.285	1.12 (0.93, 1.35)	0.235	0.76 (0.62,0.94)	0.010	1.01 (0.81,1.26)	0.915
Smoking status								
Never-smoker	ref		ref		ref		ref	
Ex-smoker	1.16 (1.05,1.29)	0.004	1.24 (1.11, 1.38)	0.0001	1.22 (1.07, 1.38)	0.002	1.29 (1.13, 1.47)	0.0001
Current smoker	1.94 (1.62,2.32)	<1E-10	1.76 (1.46, 2.12)	2.3E-09	1.79 (1.45, 2.20)	<1E-10	1.66 (1.34, 2.06)	4.3E-06
Physical Activity Index (PAI)								
Inactive	ref		ref		ref		ref	
Moderately inactive	0.96 (0.85,1.09)	0.545	0.86 (0.75,0.98)	0.024	1.07 (0.91, 1.25)	0.423	0.97 (0.82,1.14)	0.683
Moderately active	0.79 (0.70,0.89)	0.0002	0.71 (0.62,0.81)	1.9E-07	0.86 (0.74, 1.01)	0.059	0.83 (0.71,0.97)	0.018
Active	0.71 (0.63,0.81)	<1E-10	0.6 (0.53,0.69)	<1E-10	0.85 (0.73,0.99)	0.040	0.8 (0.68,0.94)	0.006
Discrimination at work								
Not discriminated against at work	ref		ref		ref		ref	
Discriminated against at work	2.19 (1.99,2.40)	<1E-10	2.12 (1.92, 2.33)	<1E-10	2.78 (2.50, 3.10)	<1E-10	2.64 (2.35, 2.95)	<1E-10
Redeployment								
Not redeployed	ref		ref		ref		ref	
Redeployed	1.24 (1.11,1.39)	0.0002	1.15 (1.03, 1.29)	0.015	1.22 (1.07, 1.40)	0.003	1.17 (1.02, 1.34)	0.028
Not working	1.1 (0.96,1.26)	0.155	0.95 (0.83, 1.10)	0.518	1.2 (1.02, 1.40)	0.024	1.09 (0.92, 1.28)	0.331
Job areas								
Not working in area specified	ref		ref		ref		ref	
Ambulance	1.18 (0.95,1.47)	0.125	1.13 (0.90, 1.42)	0.291	1.02 (0.78, 1.34)	0.860	1.18 (0.89, 1.57)	0.250
Community clinical	0.86 (0.78,0.95)	0.003	0.88 (0.80, 0.98)	0.019	0.82 (0.73, 0.93)	0.002	0.84 (0.74, 0.95)	0.006
Community non-clinical	1.22 (1.02, 1.46)	0.027	1.19 (0.99, 1.43)	0.061	1.16 (0.94, 1.44)	0.167	1.15 (0.93, 1.43)	0.200
Emergency department	1.22 (1.05, 1.43)	0.010	1.15 (0.97, 1.35)	0.104	1.12 (0.93, 1.35)	0.222	1.13 (0.93, 1.38)	0.209
Intensive care	1.39 (1.18, 1.64)	0.0001	1.19 (1.00, 1.41)	0.049	1.38 (1.13, 1.67)	0.001	1.28 (1.04, 1.56)	0.017
Inpatient setting	1.12 (1.02, 1.24)	0.022	1.05 (0.95, 1.17)	0.347	1.21 (1.07, 1.36)	0.002	1.21 (1.07, 1.38)	0.003

	Anxiety/Depression symptoms (PHQ-4 ≥3)				PTSD symptoms (PCL-C ≥5)			
	Univariable		Adjusted (Age, Sex, Ethnicity, Job role)		Univariable		Adjusted (Age, Sex, Ethnicity, Job role)	
Outpatient	0.86 (0.77,0.97)	0.010	0.94 (0.83,1.05)	0.268	0.93 (0.81,1.07)	0.303	1.04 (0.90,1.19)	0.626
Public / communal setting	1.39 (1.08,1.80)	0.012	1.36 (1.04,1.78)	0.024	1.66 (1.24,2.21)	0.001	1.76 (1.31,2.37)	0.0001
Mobile across areas	1.03 (0.80,1.32)	0.812	1 (0.78,1.30)	0.974	1.24 (0.94,1.65)	0.133	1.3 (0.97,1.73)	0.077
Prison	1.07 (0.59,1.91)	0.832	1.03 (0.57,1.87)	0.931	1.19 (0.60,2.37)	0.616	1.22 (0.61,2.45)	0.570
Other clinical setting	1.03 (0.91,1.16)	0.660	1.09 (0.96,1.24)	0.164	1.3 (1.13,1.50)	0.0002	1.37 (1.19,1.59)	1.9E-05
Nursing or care home	0.92 (0.69,1.24)	0.592	0.9 (0.67,1.22)	0.500	1.21 (0.88,1.67)	0.243	1.14 (0.82,1.58)	0.445
Psychiatric hospital / inpatient unit	1.32 (1.02,1.71)	0.035	1.26 (0.96,1.64)	0.090	1.17 (0.85,1.61)	0.325	1.13 (0.82,1.56)	0.471
At home	1.06 (0.95,1.20)	0.300	1.14 (1.01,1.28)	0.041	0.89 (0.77,1.03)	0.122	0.95 (0.81,1.10)	0.483
University	1.06 (0.80,1.41)	0.676	1.13 (0.84,1.50)	0.418	0.85 (0.59,1.22)	0.376	0.91 (0.62,1.32)	0.605
Secure about raising concerns related to clinical practice								
Secure about raising concerns	ref		ref		ref		ref	
Not secure in raising concerns	2.08 (1.89,2.33)	<1E-10	2.04 (1.81,2.27)	<1E-10	2.22 (1.96,2.50)	<1E-10	2.08 (1.81,2.38)	<1E-10
Trusts in organisation to address concerns related to clinical practice								
Trusts organisation	ref		ref		ref		ref	
Does not trust organisation	1.89 (1.72,2.08)	<1E-10	1.89 (1.72,2.08)	<1E-10	1.92 (1.72,2.17)	<1E-10	1.89 (1.67,2.08)	<1E-10
Non-COVID-19 patient contact per week								
0	ref		ref		ref		ref	
1-5	1.07 (0.86,1.33)	0.567	1 (0.80,1.25)	0.100	0.76 (0.57,1.00)	0.053	0.71 (0.54,0.95)	0.021
6-20	0.94 (0.81,1.09)	0.411	0.88 (0.75,1.03)	0.099	0.77 (0.64,0.92)	0.005	0.74 (0.61,0.89)	0.002
21-50	0.96 (0.83,1.11)	0.608	0.89 (0.76,1.04)	0.132	0.94 (0.79,1.11)	0.468	0.91 (0.76,1.09)	0.297
51+	0.98 (0.85,1.13)	0.753	0.95 (0.81,1.11)	0.505	0.99 (0.84,1.18)	0.931	0.99 (0.83,1.19)	0.956
COVID-19 patient contact per week								
0	ref		ref		ref		ref	
1-5	1.14 (0.96,1.35)	0.137	1.09 (0.92,1.30)	0.332	1.37 (1.13,1.67)	0.002	1.36 (1.11,1.67)	0.003
6-20	1.17 (1.04,1.31)	0.007	1.13 (1.00,1.28)	0.048	1.31 (1.14,1.50)	0.0001	1.33 (1.16,1.54)	9.0E-05
21-50	1.46 (1.25,1.70)	<1E-10	1.3 (1.11,1.53)	0.001	1.56 (1.30,1.88)	<1E-10	1.52 (1.26,1.85)	1.6E-05
51+	2.11 (1.69,2.63)	<1E-10	1.74 (1.38,2.19)	2.5E-06	2.33 (1.82,2.99)	<1E-10	2.08 (1.61,2.70)	2.6E-08
Current working hours per week	1.01 (1.01,1.02)	<1E-10	1.01 (1.01,1.02)	2.1E-05	1.01 (1.00,1.01)	0.0003	1.01 (1.00,1.02)	0.0003
Currently working at night								
No	ref		ref		ref		ref	
Yes	1.24 (1.13,1.37)	0.00001	1.15 (1.03,1.28)	0.012	1.27 (1.13,1.43)	0.0001	1.25 (1.09,1.42)	0.001
Access to appropriate PPE								
Not applicable or all the time	ref		ref		ref		ref	
Some or most of the time	1.66 (1.48,1.86)	<1E-10	1.56 (1.39,1.76)	<1E-10	1.84 (1.61,2.10)	<1E-10	1.78 (1.55,2.04)	<1E-10
Rarely or not at all	1.07 (0.65,1.76)	0.799	1.27 (0.76,2.12)	0.360	0.77 (0.38,1.53)	0.455	0.82 (0.41,1.66)	0.586

Table 3. Association between ethnicity (as exposure, with White ethnic group as reference group) and multiple social, health and working factors (as separate outcomes), adjusted for age, sex and job role.

Variable (Coding) ¹	Model ²	Asian/Asian British ethnic group		Black/Black British ethnic group		Mixed/Multiple ethnic group		Other ethnic group	
		Estimate ² (95%CI)	P	Estimate ² (95%CI)	P	Estimate ² (95%CI)	P	Estimate ² (95%CI)	P
Born in UK	Logistic	0.102 (0.091, 0.115)	<1E-10	0.069 (0.056, 0.084)	<1E-10	0.483 (0.388, 0.601)	<1E-10	0.045 (0.032, 0.062)	<1E-10
IMD decile (Lower = more deprived)	Linear	-0.368 (-0.507, -0.229)	2.29E-07	-1.298 (-1.551, -1.044)	<1E-10	-0.288 (-0.538, -0.038)	0.024	-0.816 (-1.171, -0.462)	7.17E-06
Religiosity (‘Not at all’, to ‘Extremely’)	Ordered logistic	4.948 (4.477, 5.469)	<1E-10	14.034 (11.766, 16.738)	<1E-10	1.219 (1.001, 1.484)	0.049	7.18 (5.63, 9.159)	<1E-10
Living with children	Logistic	1.269 (1.144, 1.409)	7.47E-06	1.282 (1.062, 1.547)	0.010	1.034 (0.855, 1.25)	0.731	1.299 (0.999, 1.688)	0.051
Living with adults 65+	Logistic	2.034 (1.691, 2.447)	<1E-10	1.268 (0.883, 1.822)	0.199	1.393 (0.963, 2.016)	0.078	1.666 (1.036, 2.681)	0.035
Bereaved due to COVID-19	Logistic	2.613 (2.351, 2.905)	<1E-10	2.52 (2.071, 3.066)	<1E-10	1.202 (0.997, 1.449)	0.054	2.836 (2.159, 3.727)	<1E-10
Long-term conditions 0, to 1, to 2 or more	Ordered logistic	1.172 (1.032, 1.332)	0.014	1.014 (0.8, 1.286)	0.907	1.498 (1.211, 1.853)	1.98E-04	1.028 (0.739, 1.43)	0.869
SARS-CoV-2 infection status	Logistic	1.021 (0.904, 1.154)	0.738	1.307 (1.059, 1.613)	0.013	0.927 (0.74, 1.161)	0.507	1.057 (0.778, 1.437)	0.721
Alcohol frequency ‘Never’ to ‘4+ times / week’	Ordered logistic	0.186 (0.168, 0.205)	<1E-10	0.178 (0.15, 0.211)	<1E-10	0.763 (0.647, 0.899)	0.001	0.129 (0.1, 0.167)	<1E-10
Smoking status ‘Never’, to ‘Ex’, to ‘Current’	Ordered logistic	0.481 (0.42, 0.552)	<1E-10	0.327 (0.245, 0.435)	<1E-10	1.265 (1.032, 1.551)	0.023	0.862 (0.631, 1.178)	0.352
Physical Activity Index ‘Inactive’ to ‘Active’	Ordered logistic	0.829 (0.757, 0.909)	6.04E-05	0.771 (0.655, 0.908)	0.002	0.942 (0.796, 1.115)	0.486	0.813 (0.641, 1.03)	0.087
Discriminated against at work	Logistic	2.19 (1.958, 2.45)	<1E-10	3.162 (2.598, 3.849)	<1E-10	1.718 (1.404, 2.104)	1.73E-07	2.303 (1.739, 3.05)	7.52E-09
Redeployed ³	Logistic	0.884 (0.772, 1.012)	0.074	0.874 (0.683, 1.118)	0.283	1.172 (0.934, 1.471)	0.170	1.038 (0.749, 1.439)	0.823
Ambulance	Logistic	0.186 (0.117, 0.295)	<1E-10	0.199 (0.081, 0.489)	4.27E-04	0.464 (0.252, 0.852)	0.013	0.467 (0.166, 1.318)	0.150
Community clinical	Logistic	0.966 (0.860, 1.085)	0.559	0.891 (0.717, 1.107)	0.298	0.924 (0.748, 1.140)	0.459	0.541 (0.385, 0.761)	4.21E-04
Community non-clinical	Logistic	0.76 (0.587, 0.983)	0.037	0.805 (0.505, 1.285)	0.363	0.913 (0.605, 1.376)	0.662	0.688 (0.319, 1.482)	0.339
Emergency department	Logistic	1.138 (0.953, 1.358)	0.152	1.202 (0.881, 1.639)	0.245	1.068 (0.776, 1.469)	0.688	1.228 (0.828, 1.820)	0.307
Intensive care	Logistic	0.969 (0.791, 1.188)	0.765	0.869 (0.589, 1.282)	0.479	1.113 (0.787, 1.574)	0.546	1.004 (0.612, 1.645)	0.988
Inpatient setting	Logistic	1.139 (1.010, 1.285)	0.034	1.011 (0.811, 1.260)	0.922	0.921 (0.735, 1.154)	0.473	1.734 (1.296, 2.321)	2.13E-04
Outpatient	Logistic	1.168 (1.033, 1.321)	0.013	0.83 (0.650, 1.061)	0.136	0.921 (0.729, 1.164)	0.492	1.352 (1.006, 1.817)	0.045
Public / communal setting	Logistic	0.806 (0.588, 1.103)	0.178	0.643 (0.334, 1.239)	0.187	0.384 (0.168, 0.876)	0.023	0.749 (0.341, 1.642)	0.470
Mobile across areas	Logistic	0.596 (0.422, 0.841)	0.003	0.593 (0.293, 1.201)	0.146	0.768 (0.434, 1.359)	0.365	0.964 (0.444, 2.090)	0.926

Variable (Coding) ¹	Model ²	Asian/Asian British ethnic group		Black/Black British ethnic group		Mixed/Multiple ethnic group		Other ethnic group	
		Estimate ² (95%CI)	P	Estimate ² (95%CI)	P	Estimate ² (95%CI)	P	Estimate ² (95%CI)	P
Other clinical setting	Logistic	1.377 (1.201,1.578)	4.57E-06	1.1 (0.850,1.423)	0.470	0.834 (0.625,1.111)	0.215	2.117 (1.571,2.852)	8.22E-07
Nursing or care home	Logistic	0.691 (0.447,1.068)	0.096	1.581 (0.935,2.675)	0.088	0.715 (0.333,1.532)	0.388	0.492 (0.120,2.010)	0.323
Psychiatric hospital / inpatient unit	Logistic	1.228 (0.899,1.678)	0.197	1.755 (1.089,2.827)	0.021	1.505 (0.911,2.487)	0.110	0.99 (0.429,2.285)	0.981
At home	Logistic	0.916 (0.793,1.057)	0.230	0.866 (0.657,1.142)	0.307	1.155 (0.908,1.469)	0.240	0.677 (0.449,1.019)	0.061
University	Logistic	0.649 (0.459,0.920)	0.015	0.589 (0.286,1.215)	0.152	1.417 (0.867,2.316)	0.164	0.817 (0.374,1.787)	0.613
Not secure about raising concerns related to clinical practice	Logistic	1.678 (1.466,1.919)	<1E-10	1.698 (1.344,2.146)	9.34E-06	0.943 (0.714,1.244)	0.676	2.000 (1.460,2.740)	1.64E-05
Does not trust organisation to address concerns related to clinical practice	Logistic	1.427 (1.279, 1.592)	2.61E-10	1.074 (0.873, 1.319)	0.500	1.161 (0.949, 1.425)	0.147	1.357 (1.030, 1.789)	0.030
COVID-19 patient contact (0, 1-5, 6-20, 21-50, 51+ pts/week)	Ordered logistic	1.153 (1.04, 1.278)	0.007	1.189 (0.991, 1.427)	0.062	0.959 (0.794, 1.16)	0.668	1.463 (1.139, 1.879)	0.003
Non-COVID-19 patient contact (0, 1-5, 6-20, 21-50, 51+ pts/week)	Ordered logistic	0.994 (0.906, 1.09)	0.894	0.819 (0.691, 0.972)	0.022	0.867 (0.734, 1.023)	0.091	1.01 (0.796, 1.282)	0.934
Working hours	Linear	0.246 (-0.243, 0.736)	0.324	1.779 (0.898, 2.661)	7.68E-05	0.104 (-0.772, 0.98)	0.816	0.691 (-0.557, 1.938)	0.278
Night shift working	Logistic	1.072 (0.947, 1.214)	0.271	1.352 (1.09, 1.678)	0.006	0.941 (0.748, 1.184)	0.604	1.541 (1.147, 2.071)	0.004
Does not always have access to appropriate PPE ³	Logistic	1.629 (1.425, 1.863)	<1E-10	1.544 (1.219, 1.955)	0.000	1.197 (0.929, 1.541)	0.164	1.801 (1.316, 2.463)	2.34E-04

¹See also Table 1 and Supplementary Text. Regressions for 'household size' and 'working in prison' are not presented due to lack of model convergence

²Effect estimates are odds ratios (OR) for logistic and ordered logistic models, and beta coefficients for linear models

³Recoded to 'yes' vs 'no'

Figure 1. Odds ratios for each of four ethnic groups compared to the 'White' ethnic group for each of the four statistical models for Anxiety/Depression and PTSD.

