BJPsych | The British Journal of Psychiatry (2022)
220, 21–30. doi: 10.1192/bjp.2021.132

Pre-pandemic mental health and disruptions to healthcare, economic and housing outcomes during the COVID-19 pandemic: evidence from 12 UK longitudinal studies

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Background

The COVID-19 pandemic has disrupted lives and livelihoods, and people already experiencing mental ill health may have been especially vulnerable.

Aims

Quantify mental health inequalities in disruptions to healthcare, economic activity and housing.

Method

We examined data from 59 482 participants in 12 UK longitudinal studies with data collected before and during the COVID-19 pandemic. Within each study, we estimated the association between psychological distress assessed pre-pandemic and disruptions since the start of the pandemic to healthcare (medication access, procedures or appointments), economic activity (employment, income or working hours) and housing (change of address or household composition). Estimates were pooled across studies.

Results

Across the analysed data-sets, 28% to 77% of participants experienced at least one disruption, with 2.3–33.2% experiencing disruptions in two or more domains. We found 1 s.d. higher pre-pandemic psychological distress was associated with (a) increased odds of any healthcare disruptions (odds ratio (OR) 1.30, 95% CI 1.20–1.40), with fully adjusted odds ratios ranging from 1.24 (95% CI 1.09–1.41) for disruption to procedures to 1.33 (95% CI 1.20–1.49) for disruptions to prescriptions or medication access; (b) loss of employment (odds ratio 1.13, 95% CI 1.06–1.21) and income (OR 1.12, 95% CI 1.06 –1.19), and reductions in working hours/furlough (odds ratio 1.05, 95% CI 1.00–1.09) and (c) increased likelihood of experiencing a disruption in at least two domains (OR 1.25, 95% CI 1.18–1.32) or in one domain (OR 1.11, 95% CI 1.07–1.16), relative to no disruption. There were no associations with housing disruptions (OR 1.00, 95% CI 0.97–1.03).

Conclusions

People experiencing psychological distress pre-pandemic were more likely to experience healthcare and economic disruptions, and clusters of disruptions across multiple domains during the pandemic. Failing to address these disruptions risks further widening mental health inequalities.

Keywords

COVID-19; healthcare; economic; psychological distress; adverse outcomes; inequalities.

The COVID-19 pandemic and consequent mitigation measures have led to notable changes to routine healthcare delivery, economic participation and housing circumstances in many countries. There is extensive evidence that the negative effects of the pandemic disproportionately affect certain sociodemographic groups (e.g. the socioeconomically disadvantaged, ethnic minorities, younger generations and women).[1] However, although poor mental health might be an important indicator of inequity in these outcomes, little is known about whether individuals with poor mental health are at particular risk of these disruptions during the pandemic.[2,3]

Mental health conditions like depression and anxiety are widespread in the population, with one in six adults estimated to experience these conditions at any given time.[4] People with prior mental health difficulties have higher risk for COVID-19-related adverse outcomes, including greater risk of infection, severe disease and mortality.[5] In addition, these individuals had already experienced greater risk of social and health inequalities before the pandemic.[6,7] Moreover, recent evidence suggests they are less likely to be vaccinated, further increasing the risk of infection-related adverse outcomes for this group.[8] There has been less attention paid to whether non-infection-related outcomes of the pandemic, such as healthcare, economic and housing disruptions, have been differentially experienced by those with poor mental health. Evidence from previous disruptive events, such as economic recessions, highlights greater negative consequences for those with poor mental health.[9]

The current study

This study investigates the extent to which pre-pandemic psychological distress (symptoms of anxiety and depression) was associated with experiences of healthcare, economic and housing disruptions in the UK during the COVID-19 pandemic. We examine whether this association differs between sociodemographic groups based on gender, age, ethnicity and socioeconomic position. We also examine the prevalence of, and associations with, disruptions across multiple domains, as people who face adverse disruptions in multiple domains are likely to have poorer longer-term outcomes. We use data from >59 000 participants across 12 UK population-based longitudinal studies with rich pre-pandemic sociodemographic and health measures, and detailed information about disruptions during the pandemic.

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https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

Method

Design

The UK National Core Studies – COVID-19 Longitudinal Health and Wellbeing initiative aims to coordinate primary analyses across multiple UK longitudinal population-based studies (https://www.ucl.ac.uk/drupal/site_covid-19-longitudinal-health-wellbeing/). Even with the same research question and data source, research has highlighted that results can vary because of methodological heterogeneity and researcher decisions.[10] In this programme of work, by conducting analyses in a coordinated manner across different data-sets, we minimise such biases and maximise comparability, and appropriately account for the study design and characteristics of individual data-sets. Synthesis of findings across studies allows pooling of evidence across a larger sample size, including subgroup analyses by age and other sociodemographic groups (e.g. gender, ethnicity).

Participants

Data were drawn from 12 UK population studies that conducted surveys both before and during the COVID-19 pandemic. Details of the design, sample frames, current age range, timing of the most recent pre-pandemic and COVID-19 surveys, response rates and analytical sample size are available in Table 1. Demographic and socioeconomic characteristics of each analytical sample are presented in Supplementary Table 1 available at https://doi.org/10.1192/bjp.2021.132.

Six of these studies were age-homogenous birth cohorts (all individuals of a similar age): the Millennium Cohort Study (MCS[11]), the Avon Longitudinal Study of Parents and Children (ALSPAC G1[12]), Next Steps (formerly known as the Longitudinal Study of Young People in England[13]), the 1970 British Cohort Study (BCS70[14]), the National Child Development Study (NCDS[15]) and the National Survey of Health and Development (NSHD[16]).

The other six studies covered a range of ages. These age-heterogenous studies were Understanding Society (USOC[17]), the English Longitudinal Study of Ageing (ELSA[18]), Generation Scotland: the Scottish Family Health Study,[19,20] the UK Adult Twin Registry (TWINSUK[21]), the Genetic Links to Anxiety and Depression study (GLAD[22]; a cohort of those with experience of anxiety and/or depression) and the parents of the ALSPAC G1 cohort (ALSPAC G0[23]).

Analytical samples included those who had a measure of psychological distress in a recent pre-pandemic survey, had information available for at least one outcome in a COVID-19 survey and had valid data on a minimum set of covariates (gender, ethnicity, socioeconomic position and age). Each study was weighted to be representative of its target population, accounting for sampling design, attrition up to the most recent pre-pandemic survey and differential non-response to the COVID-19 surveys.

Ethical approvals were received for data collection in all studies, and the specifics for each included study are detailed in Supplementary File 2.

Measures

Below, we describe the overall approach to measuring each variable in the analysis. Full details of the questions and coding used within each cohort are available in Supplementary File 1.

Exposure: pre-pandemic psychological distress

All studies measured psychological distress in the most recent pre-pandemic survey, using validated continuous scales. These included the GHQ-12 in Next Steps and USOC, GHQ-28 for NSHD and Generation Scotland, Malaise Inventory in NCDS and BCS70, K-6 in MCS and CES-D in ELSA. Supplementary Table 2 presents details of the measure in each study, including when it was last collected, its distribution (mean, range and s.d.) and the percentage with high psychological distress in each study. Pre-pandemic measures of distress had been taken some years before the pandemic (median 3.3 years, interquartile range 1.9–6.5 years). Each scale was transformed into s.d. units (z-scores) within each cohort, and we conducted additional analyses by using dichotomous variables based on established cut-offs for each measure.

Outcomes

Outcomes were disruptions separated into three broad domains: healthcare, economic activity and housing. For healthcare, we assessed any reported disruptions to prescriptions or medication access, procedures or surgery, and appointments (e.g. with a general practitioner or out-patient services). Any deviation from planned/existing treatment was coded as a disruption, regardless of the reason for the disruption. In the economic domain we assessed disruptions to usual economic activity (i.e. education/training, occupations), job loss, loss of income and any changes in working hours (including furlough). Housing disruptions included any loss of housing or change of address, and any changes in household composition (i.e. who the participant lives with). We generated variables indicating any disruption within each domain, and the number of domains in which disruptions had occurred: no disruptions, disruption in one domain or disruptions in two or more domains. Where multiple survey waves had been conducted during the pandemic, we produced a single variable indicating any relevant disruption reported up to and including the most recent survey. Most studies had at least 7 months of follow-up after the start of the pandemic, in March 2020 (see Table 1 for details).

Other variables

All covariates were based on pre-pandemic assessments. We explored subgroup differences by gender (female or male), ethnicity (White or Black, Asian and minority ethnic; in cohorts where possible), socioeconomic position measured by highest education level (degree or no degree), and age (16–24, 25–34, 35–44, 45–54, 55–64, 65–74 or ≥75 years). Age-homogeneous cohorts were included in their corresponding age band.

The following covariates were included where relevant and available within each study: UK nation (i.e. England, Scotland, Wales or Northern Ireland), partnership status (single or not single), presence of children in the household, housing tenure (owned/mortgage or rented/other), own occupational class (or parental occupational class for younger cohorts; four categories: managerial/professional, intermediate, routine or never worked/not available/long-term non-employed), prior chronic conditions or illness (yes or no) and an indicator of physical disability (yes or no).

Analysis

Within each study, the association between each binary disruption outcome and standardised pre-pandemic psychological distress was examined with logistic regression models. To examine whether poor mental health is associated with disruptions above and beyond well-known sociodemographic and health characteristics, we conducted a multivariable analyses and controlled for a range of factors. Following unadjusted associations, first we adjusted for a common set of covariates across all studies, including, where

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Table 1 Details of each included study

Study population	Design and sample frame	2020 Age range in years	Most recent pre-pandemic survey	Details of 2020 COVID-19 surveys (response rate)	Analytic *N*
Age-homogenous cohorts					
Millennium Cohort Study	Cohort of UK children born between Sep 2000 and Jan 2002, with regular follow-up surveys from birth	18–20	2018	Two surveys: May (26.6%) and Sep–Oct (24.2%)	3028
Avon Longitudinal Study of Parents and Children – Generation 1	Cohort of children born in the South-West of England between Apr 1991 and Dec 1992, with regular follow-up questionnaires from birth (original young people)	27–29	2017–2018	Three questionnaires: Apr (19%), Jun (17.4%) and Dec (26.4%)	2698
Next Steps, formerly known as Longitudinal Study of Young People in England	Sample recruited via secondary schools in England at around age 13 years, with regular follow-up surveys thereafter	29–31	2015	Two surveys: May (20.3%) and Sep–Oct (31.8%)	3209
1970 British Cohort Study	Cohort of all children born in Great Britain (i.e. England, Wales and Scotland) in 1 week in 1970, with regular follow-up surveys from birth	50	2016	Two surveys: May (40.4%) and Sep–Oct (43.9%)	4303
National Child Development Study	Cohort of all children born in Great Britain (i.e. England, Wales and Scotland) in 1 week in 1958, with regular follow-up surveys from birth	62	2013	Two surveys: May (57.9%) and Sep–Oct (53.9%)	5394
National Survey of Health and Development	Cohort of all children born in Great Britain (i.e. England, Wales and Scotland) in 1 week in 1946, with regular follow-up surveys from birth	74	2015	Two surveys: May (68.2%) and Sep–Oct (61.5%)	1310
Age-heterogeneous studies					
Understanding Society: the UK Household Longitudinal Survey	A nationally representative longitudinal household panel study, based on a clustered-stratified probability sample of UK households, with all adults aged ≥16 years in chosen households surveyed annually	16–96	2018–2019	Six: surveys: Apr (40.3%), May (33.6%), Jun (32.0%), Jul (31.2%), Sep (29.2%) and Nov (27.3%)	13 175
English Longitudinal Study of Ageing	A nationally representative population study of individuals aged ≥50 years living in England, with biennial surveys and periodic refreshing of the sample to maintain representativeness	52 to ≥90	2018–2019	Two surveys: Jun–Jul (75%) and Nov–Dec (73%)	5061
Generation Scotland: the Scottish Family Health Study	A family-structured, population-based Scottish cohort, with participants aged 18–99 years recruited between 2006–2011	27–100	2006–2011	Two surveys: Apr–Jun (21.6%) and Jul–Aug (15.6%)	3179
Avon Longitudinal Study of Parents and Children – Generation 0	Parents of the generation 1 cohort described above, treated as a separate age-heterogenous study population (original parents)	45–81	2011–2013	Three questionnaires: Apr (12.4%), Jun (12.2%) and Dec (14.3%)	3212
UK Adult Twin Registry	A cohort of volunteer adult twins (55% monozygotic and 43% dizygotic) from around the UK who were sampled between 18–101 years of age	22–96	2017–2018	Three surveys: Apr (64.3%), Jul (77.6%) and Nov (76.1%)	2855
Genetic Links to Anxiety and Depression study	Participants with depression and/or anxiety aged ≥16 years from the 2018 Genetic Links to Anxiety and Depression study were invited to take part in COVID-19 surveys as part of a new project, the COVID-19 Psychiatry and Neurological Genetics study (COPING)	16–89	2018–2021 (data from Genetic Links to Anxiety and Depression study)	Fortnightly data collection from Apr to Jul (20.4%), then monthly (19.7%)	12 107

relevant, age, gender, ethnicity, education and UK nation (adjustment 1). Second, we further accounted for relevant prior health and other relevant confounders, such as partnership status, presence of children, housing tenure, occupational class, prior chronic conditions and physical disability (adjustment 2). For this additional adjustment, variables were created to be as comparable as possible across studies while being suitable for cohort-specific characteristics. Subgroup differences were explored with stratified regressions predicting any disruption in each domain, and the minimal adjustment set (for optimal comparability across studies). Details of all these measures and how they were assessed in each study are presented in Supplementary File 1. As an additional sensitivity analysis, the non-stratified models predicting any disruption in each domain were repeated with established categorical cut-offs (reflecting high psychological distress symptoms) as the exposure. Details of the measure-specific cut-off points used are available in Supplementary File 2.

Results from each study were then pooled for each outcome across the studies overall, and then stratified by gender, education level, ethnicity and age. We used a random-effects meta-analysis with restricted maximum likelihood. We report heterogeneity with the I^2 statistic.[24] We used random-effects meta-regression to investigate whether the between-study heterogeneity could be explained by the time since pre-pandemic mental health measure,

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

categorised as ≤2 years, 2–5 years, 5–7 years and ≥7 years. Meta-analyses were conducted in Stata version 16 for Windows.[25]

Results

Descriptive statistics

Between 7% (TWINSUK) and 24% (Next Steps) of participants from the population-based cohorts and 54% of participants in GLAD (reflecting their recruitment of those with mental health difficulties) reported high psychological distress before the pandemic. As expected, the prevalence of psychological distress was generally higher among women, those without a degree and younger age groups (see Supplementary Tables 3 and 4 for full percentages of individuals classified as having high psychological distress, stratified by sociodemographic characteristics). Table 2 shows the percentage of respondents who reported disruptions: this ranged from <10% (MCS, GLAD and TWINSUK) to 37% (ELSA) for healthcare; from 10% (NSHD) to 51% (USOC) for the economic domain; and from 2% (NSHD) to 36% (MCS) for housing. Between 28% (NSHD) and 77% (USOC) of study participants experienced at least one of these disruptions during the pandemic (see Supplementary Table 5 for the percent prevalence of any healthcare, economic and housing disruptions during the pandemic by gender, ethnicity, education level and age group).

Pre-pandemic psychological distress and disruptions during the pandemic

The associations between standardised psychological distress and each outcome are illustrated in Fig. 1. Table 3 shows the meta-analysed estimates for each outcome from the unadjusted, adjustment 1 and adjustment 2 models, and the heterogeneity in estimates (details of coefficients from each cohort and their weight in the meta-analysis for each outcome are available in Supplementary File 3). Heterogeneity was lower in meta-analyses with greater adjustment, and ranged from 0 to 66.8% across the different outcomes examined for the fully adjusted estimates.

In the fully adjusted models, 1 s.d. higher psychological distress was associated with increased odds of any healthcare disruptions (odds ratio 1.30, 95% CI 1.20–1.40), with odds ratios ranging from 1.24 to 1.33 for the different healthcare outcomes examined. Odds ratios for each study were consistently >1 for all outcomes, with a few exceptions; however, a substantial range was observed. For instance, odds ratios were between 1.03 and 1.53 for any healthcare disruption for the population-representative cohorts, but higher (odds ratio 2.18) in GLAD, which is a convenience sample with a higher proportion of participants with prior mental health difficulties.

For economic disruptions overall, 1 s.d. higher psychological distress was associated with a higher likelihood of experiencing any economic disruption (odds ratio 1.11, 95% CI 1.05–1.16), with associations found for loss of employment (odds ratio 1.13, 95% CI 1.06–1.21) and loss of income (odds ratio 1.12, 95% CI 1.06–1.19), and a smaller effect for reductions in working hours or furlough (odds ratio 1.05, 95% CI 1.00–1.09). Some differences in study-level estimates were observed here, which likely reflect differences in study members' ages. For instance, there were no observed associations with employment loss in older studies such as ELSA and NSHD, perhaps reflecting the lower proportions working beyond retirement age and the likelihood of those with good mental health being in this group.

There was no consistent evidence that prior psychological distress was associated with housing disruptions (odds ratio 1.01, 95% CI 0.97–1.05).

We found an association between 1 s.d. greater psychological distress before the pandemic and an increased likelihood of experiencing disruption in at least two domains (relative risk ratio 1.25, 95% CI 1.18–1.32) or in one domain (relative risk ratio 1.11, 95% CI 1.07–1.16), relative to experiencing no disruption (Fig. 2).

Results from the meta-regression suggest that time since the pre-pandemic mental health measure does not explain the between-study heterogeneity (Supplementary Table 6).

Stratified analyses

We explored subgroup differences in the associations between prior mental health and overall disruptions and found no evidence that associations differed by gender, education level, age or ethnicity (see Supplementary Table 7).

High psychological distress (binary indicator of caseness) as exposure

We conducted an additional analysis, using a binary indicator of pre-pandemic high psychological distress. This was based on measure-specific cut-off scores that indicate clinical levels of distress (see results in Supplementary File 3). Overall, findings were similar to those seen with continuous measures, with the largest associations seen for healthcare disruptions, followed by economic disruptions and no associations for housing disruptions. However, the observed effect sizes vary because of the different distribution and meaning of the dichotomised exposure. For instance, based on this binary exposure, high psychological distress was associated with an increased likelihood of experiencing disruptions in at least two domains (odds ratio 1.46, 95% CI 1.28–1.67) compared with one domain (odds ratio 1.18, 95% CI 1.04–1.33), relative to experiencing no disruption.

Discussion

In our coordinated analysis of data from 12 UK-based longitudinal cohort studies, we found that people with poor pre-pandemic mental health have experienced greater disruption to their lives across multiple domains during the COVID-19 pandemic. More specifically, prior mental health difficulties were associated with greater likelihood of all examined healthcare disruptions (24–33% greater odds) and economic disruptions (5–13% greater odds), but not associated with housing disruptions. Further, the impact of prior mental health on these outcomes was not different by gender, education, age or ethnicity, although pre-pandemic psychological distress was generally more common among women, younger generations, and those with fewer qualifications. Finally, greater prior mental health difficulties were associated with greater likelihood of disruptions in multiple domains, with 11% greater odds of disruption in one domain and 25% greater odds of disruptions in two or three domains.

Healthcare disruptions have been widespread in the UK, with numbers of treatments for non-COVID-19 illness dropping by millions compared with previous years.[26] There has been a substantial decrease in the number of people attending accident and emergency services,[27] and reports of difficulties and delays accessing medication.[28,29] Reporting of healthcare disruptions ranged from <10 to 37% across the included studies; this wide range may reflect both true gradients by age, and differences in sampling and assessment measures used.[30] Disruptions associated with prior psychological distress included around a 24% greater odds of missed appointments and procedures, and 33% greater odds of interruptions to prescriptions or medication access. Information on reasons for disruptions to healthcare access was not consistently available across

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

Table 2 Percent prevalence (and 95% confidence intervals) of any healthcare, economic, and housing disruptions during the pandemic, and cumulative disruptions, by study

Based on data until	MCS Oct 2020	ALSPAC G1 Jan 2021	Next Steps Oct 2020	BCS70 Oct 2020	NCDS Oct 2020	NSHD Oct 2020	USOC Nov 2020	ELSA Dec 2020	Generation Scotland Sep 2020	ALSPAC G0 Jan 2021	TWINSUK Nov 2020	GLAD Jan 2021
Any healthcare disruption	9.6 (7.9–11.5)	15.9 (14.3–17.6)	11.6 (9.4–14.3)	13.3 (11.7–15.1)	15.3 (13.9–16.8)	18.5 (14.7–22.9)	31.9 (30.8–32.9)	36.7 (34.9–38.4)	27.4 (25.9–29.0)	19.9 (18.1–21.9)	8.7 (7.7–9.8)	0.7 (0.6–0.9)
Prescription/ medication access	3.3 (2.6–4.2)	—	3.8 (2.5–5.7)	3.3 (2.6–4.3)	2.5 (1.9–3.2)	2.3 (1.3–4.2)	5.6 (5.1–6.2)	0.8 (0.5–1.3)	6.7 (5.8–7.6)	—	2.9 (2.5–3.4)	0.7 (0.6–0.9)
Procedures or surgery	1.0 (0.5–2.2)	1.6 (1.2–2.1)	1.3 (0.5–3.5)	0.8 (0.5–1.0)	2.1 (1.6–2.8)	2.4 (1.3–4.5)	12.3 (11.6–13.1)	21.4 (20.0–22.9)	2.9 (2.4–3.6)	2.9 (2.1–3.9)	—	—
Appointments	6.4 (5.1–8.1)	11.7 (10.3–13.2)	7.2 (5.6–9.1)	10.2 (8.8–11.8)	12.0 (10.7–13.2)	14.3 (10.9–18.4)	28.5 (27.5–29.5)	21.3 (19.8–22.9)	22.0 (20.6–23.5)	14.4 (12.8–16.2)	—	—
Any economic disruption	43.6 (40.5–46.8)	50.2 (47.6–52.9)	41.0 (37.8–44.3)	40.8 (38.4–43.2)	36.8 (35.1–38.6)	10.0 (6.7–14.8)	51.5 (50.3–52.7)	30.2 (28.5–32.0)	20.8 (19.4–22.2)	48.6 (46.2–51.1)	30.9 (29.2–32.6)	41.9 (41.0–42.8)
Main economic activity	35.1 (31.2–39.2)	43.3 (40.6–46.0)	7.9 (5.7–10.7)	5.9 (4.9–7.0)	6.6 (5.8–7.4)	0.9 (0.5–1.5)	n/a	4.6 (3.8–5.6)	10.3 (9.3–11.4)	46.6 (43.7–49.4)	17.6 (16.6–18.6)	41.0 (40.1–41.9)
Employment	8.3 (6.0–11.3)	6.4 (5.1–7.9)	7.4 (5.3–10.3)	5.8 (4.9–6.9)	6.3 (5.6–7.2)	0.7 (0.4–1.3)	6.1 (5.6–6.7)	1.4 (1.0–2.0)	0.2 (0.05–0.3)	12.3 (10.7–14.2)	9.3 (8.6–10.1)	6.8 (6.4–7.3)
Income	24.8 (22.1–27.8)	23.5 (21.4–25.8)	26.0 (23.0–29.1)	24.1 (21.9–26.4)	20.4 (18.9–22.0)	8.7 (5.4–13.6)	36.8 (35.6–38.0)	24.5 (22.9–26.1)	13.1 (11.9–14.3)	29.8 (27.5–32.2)	27.48 (26.32–28.67)	
Working hours/ furlough	39.8 (33.5–46.4)	42.6 (39.9–45.4)	26.9 (24.0–30.1)	30.3 (28.3–32.4)	41.2 (38.2–43.7)	3.8 (2.6–5.5)	51.8 (50.6–53.0)	20.4 (18.9–22.0)	6.5 (5.7–7.4)	43.4 (40.5–46.5)	11.0 (10.2–11.9)	20.2 (19.4–20.9)
Any housing disruption	35.8 (32.5–39.3)	23.3 (21.6–25.2)	15.2 (12.8–18.0)	12.7 (11.3–14.1)	9.7 (8.3–10.7)	2.2 (1.3–3.7)	31.8 (30.7–33.0)	24.4 (22.8–26.1)	7.7 (6.8–8.7)	15.3 (13.9–16.8)	6.8 (6.0–7.8)	12.3 (11.8–12.9)
Housing loss/change	2.4 (1.7–3.4)	16.7 (15.2–18.4)	1.4 (0.8–2.4)	0.3 (0.2–0.6)	0.01 0.0–0.02)	0	4.5 (4.0–5.1)	1.8 (1.4–2.4)	0.8 (0.5–1.2)	2.1 (1.5–2.9)	2.5 (2.1–2.9)	3.8 (2.0–3.4)
Household composition	35.4 (32.1–38.8)	5.3 (4.4–6.4)	15.1 (12.6–17.9)	12.5 (11.2–14.0)	9.7 (8.8–10.7)	3.4 (2.0–5.6)	29.2 (28.2–30.3)	22.6 (21.1–24.2)	7.7 (6.8–8.7)	10.6 (9.5–11.8)	4.5 (4.0–5.1)	12.2 (11.6–12.7)
Cumulative disruptions												
No disruptions	35.1 (31.8–38.6)	46.5 (44.5–48.6)	47.2 (43.8–50.6)	45.9 (43.4–48.4)	49.2 (47.3–51.0)	72.0 (66.7–76.8)	23.0 (22.0–23.9)	34.7 (33.1–36.4)	52.4 (50.7–54.2)	43.4 (41.3–45.5)	60.8 (59–62.6)	52.4 (51.5–53.3)
Any one domain disrupted	43.0 (39.8–46.2)	40.8 (38.8–42.8)	39.0 (36.0–42.3)	42.4 (40.0–44.8)	40.5 (38.7–42.3)	25.7 (21.0–31.0)	43.9 (42.8–44.9)	42.3 (40.5–44.1)	39.7 (38.0–41.5)	43.4 (41.3–45.6	31.5 (29.8–33.2)	41.1 (40.2–41.9)
Two domains disrupted	20.0 (17.4–22.8)	11.7 (10.4–13.1)	12.4 (10.1–15.0)	10.8 (9.5–12.4)	9.6 (8.6–10.7)	2.3 (1.2–4.5)	27.5 (26.5–28.4)	20.0 (18.5–21.6)	7.4 (6.5–8.3)	11.7 (10.3–13.2)	6.7 (5.8–7.7)	6.5 (6.1–7.0)
All three domains disrupted	1.9 (1.4–2.6)	1.1 (0.7–1.6)	1.4 (0.7–2.9)	0.8 (0.6–1.2)	0.7 (0.5–0.9)	0	5.7 (5.2–6.3)	3.0 (2.4–3.7)	0.5 (0.2–0.8)	1.5 (1.0–2.1)	0.5 (0.3–0.8)	0.02 (0.01–0.08)

Each study used weighted data. The detailed prevalence for each disruption can be found in Supplementary File 2 (see Supplementary Table 5). TWINSUK had an additional question: 'Have you experienced healthcare disruption as a result of the COVID-19 pandemic?' This data was also used to derive the 'any healthcare disruption' variable for TWINSUK. MCS, Millennium Cohort Study; ALSPAC G1, Children of the Avon Longitudinal Study of Parents and Children – Generation 1; BCS70, 1970 British Cohort Study; NCDS, National Child Development Study; NSHD, National Survey of Health and Development; USOC, Understanding Society; ELSA, English Longitudinal Study of Ageing; TWINSUK, UK Adult Twin Registry; ALSPAC G0, parents of ALSPAC G1.

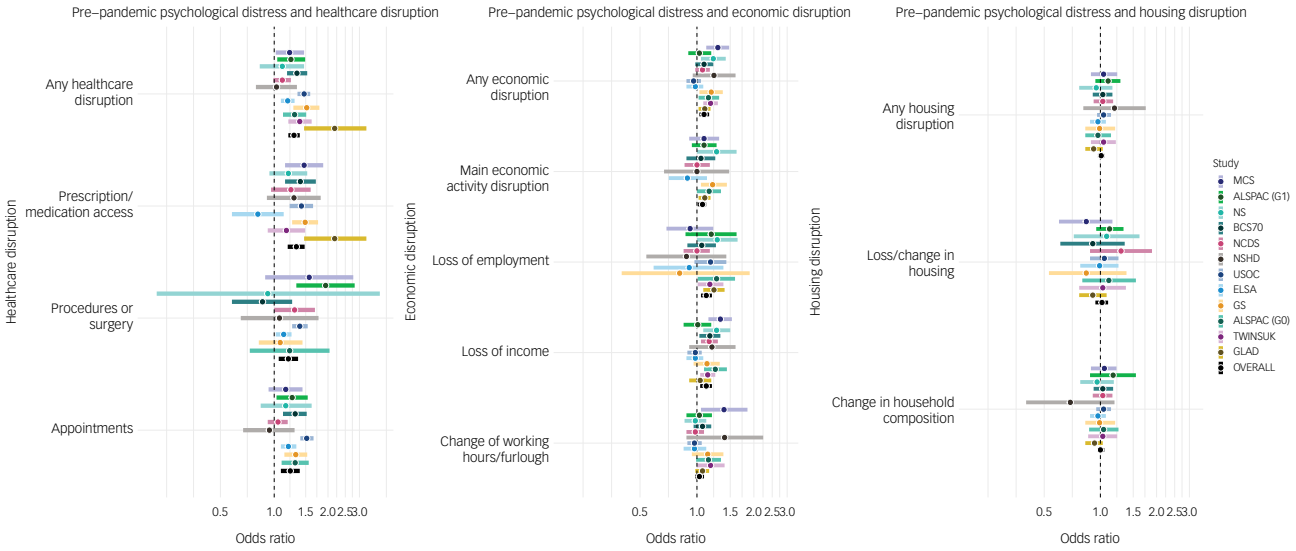

Fig. 1 Odds ratios between standardised psychological distress and each examined disruption. Estimates are adjusted for age, gender, ethnicity, education, UK nation, partnership status, presence of children, housing tenure, occupational class, prior chronic conditions, and physical disability, as appropriate and available in each cohort. ALSPAC G0, Avon Longitudinal Study of Parents and Children; ALSPAC G1, parents of the ALSPAC G0 cohort; BCS70, 1970 British Cohort Study; ELSA, English Longitudinal Study of Ageing; GLAD, Genetic Links to Anxiety and Depression study: MCS, Millennium Cohort Study; NCDS, National Child Development Study: NSHD, National Survey of Health and Development; TWINSUK, UK Adult Twin Registry; USOC, Understanding Society.

studies, and could include attempts to protect the National Health Service, patients or providers cancelling appointments, individuals being unable to rebook appointments, or being faced with complexities in the requirements for rebooking appointments or changing healthcare needs. Disruptions to healthcare are problematic owing to both their potential longer-term adverse effects on health outcomes and the potential stress involved. Sociodemographic inequalities in healthcare access during the pandemic have been recorded across different data sources. Women, ethnic minorities and those living in more deprived areas were more likely to experience healthcare disruptions,[30,31] and prior mental health might help explain some of these observed sociodemographic inequalities. Furthermore, since women, ethnic minorities and those with lower levels of education were more likely to have experienced psychological distress before the pandemic, these mental health-related disruptions to healthcare may also widen pre-pandemic social inequalities in health.

The pandemic has also affected economic activity, with large numbers of people losing jobs, being put on furlough and experiencing drops in household incomes.[32,33] Around 20–60% of individuals in working-age cohorts reported disruptions to economic activity. As expected, this was lower in retired cohorts (e.g. 10% in the NSHD cohort, who are now 75 years old). We found that 1 s.d. of greater pre-pandemic psychological distress increased the likelihood of disruption by 10% to main economic activity, 13% to loss of employment, 12% to loss of income and 5% reductions in working hours or furlough. We did not examine potential positive economic outcomes, such as starting a new business or increases in income or working hours. It is possible that there are differences in the ability of those with mental health difficulties to have economically

Table 3 Meta-analysed associations between standardised psychological distress and healthcare, economic and housing disruptions

	Unadjusted		Adjustment 1		Adjustment 2	
	Odds ratio (95% CI)	I^2	Odds ratio (95% CI)	I^2	Odds ratio (95% CI)	I^2
Any healthcare disruption	1.39 (1.30–1.48)	67.7%	1.40 (1.29–1.51)	79.8%	1.30 (1.20–1.40)	65.1%
Prescription/medication access	1.53 (1.39–1.69)	55.5%	1.52 (1.37–1.68)	56.7%	1.33 (1.20–1.49)	52.3%
Procedures or surgery	1.34 (1.22–1.46)	42.0%	1.35 (1.20–1.52)	65.1%	1.24 (1.09–1.41)	54.5%
Appointments	1.31 (1.22–1.41)	65.1%	1.31 (1.19–1.44)	81.0%	1.24 (1.14–1.36)	66.8%
Any economic disruption	1.09 (1.03–1.16)	80.8%	1.05 (0.97–1.13)	87.7%	1.11 (1.05–1.16)	60.5%
Main economic activity	1.06 (0.99–1.13)	62.4%	1.03 (0.96–1.10)	60.8%	1.10 (1.05–1.15)	0.0%
Loss of employment	1.09 (1.00–1.19)	58.7%	1.06 (0.99–1.15)	44.4%	1.13 (1.06–1.21)	12.0%
Loss of income	1.11 (1.04–1.20)	81.3%	1.10 (1.02–1.19)	83.4%	1.12 (1.06–1.19)	63.3%
Change in working hours/furlough	1.07 (1.00–1.13)	69.2%	1.01 (0.94–1.08)	74.0%	1.05 (1.00–1.09)	18.7%
Any housing disruption	1.04 (1.00–1.07)	16.0%	1.00 (0.97–1.03)	0.0%	1.01 (0.97–1.05)	0.0%
Loss of housing	1.12 (1.06–1.18)	0.0%	1.05 (0.99–1.12)	0.0%	1.02 (0.94–1.10)	0.0%
Household composition	1.04 (1.00–1.08)	14.1%	1.00 (0.96–1.03)	0.0%	1.01 (0.97–1.05)	0.0%
Cumulative disruptions						
1 disruption versus none	1.12 (1.06–1.16)	58.6%	1.09 (1.03–1.14)	68.4%	1.11 (1.07–1.16)	32.1%
≥2 disruptions versus none	1.28 (1.22–1.34)	40.6%	1.23 (1.15–1.31)	61.4%	1.25 (1.18–1.32)	37.5%

Adjustment 1 was adjusted for age, gender, ethnicity, education and UK nation. Adjustment 2 was adjusted for age, gender, ethnicity, education, UK nation, partnership status, presence of children, housing tenure, occupational class, prior chronic conditions and physical disability.

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

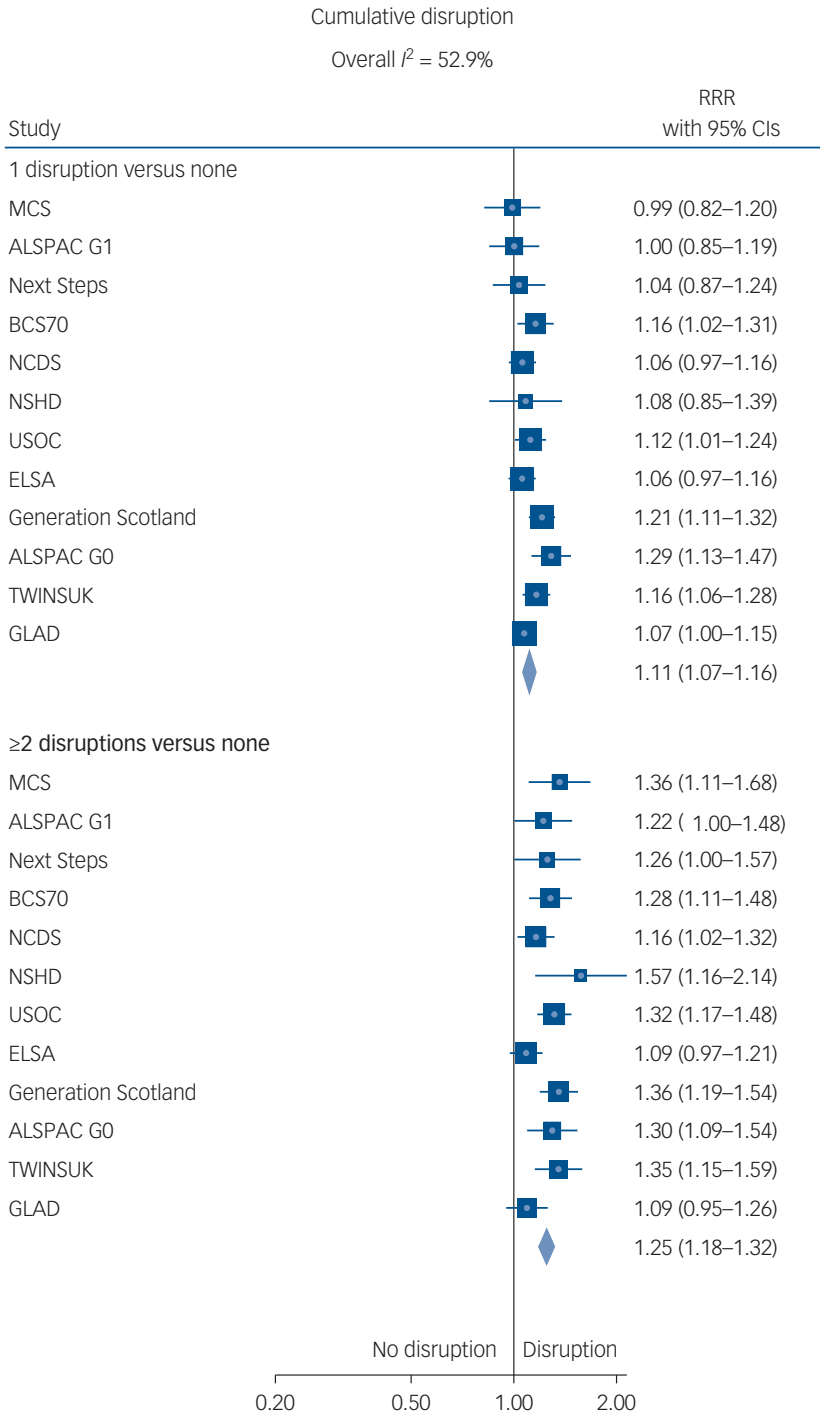

Fig. 2 Associations between standardised psychological distress and cumulative disruptions. Models adjusted for age, gender, ethnicity, education, UK nation, partnership status, presence of children, housing tenure, occupational class, prior chronic conditions and physical disability. ALSPAC G0, Avon Longitudinal Study of Parents and Children; ALSPAC G1, parents of the ALSPAC G0 cohort; BCS70, 1970 British Cohort Study; ELSA, English Longitudinal Study of Ageing; GLAD, Genetic Links to Anxiety and Depression study: MCS, Millennium Cohort Study; NCDS, National Child Development Study: NSHD, National Survey of Health and Development; RRR, relative risk ratio; TWINSUK, UK Adult Twin Registry; USOC, Understanding Society.

benefitted or coped with additional or changed work demands during the pandemic. Younger workers, ethnic minorities and women have been more likely to be in disrupted sectors and become unemployed or furloughed.[34] Younger workers have been more likely to lose their jobs and report drops in income than older workers, reflecting their already more precarious labour market situation.[33] However, the associations between prior mental health and poorer economic outcomes were not different across age and other sociodemographic groups. Again, given the sociodemographic inequalities in pre-pandemic mental health, this highlights how the pandemic may widen existing mental health and sociodemographic inequalities.

With overcrowded housing increasing risk of COVID-19 transmission, disparities in housing disruption are likely to affect the risk of COVID-19 infection and other poor health and economic

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

outcomes.[35] Although there have been reported changes in housing situations during the pandemic, with evidence of younger people moving themselves and older adults having people move into their households,[36] we found no associations in the risk of housing disruptions with prior mental health in this study. This finding might reflect policies that were designed to minimise home loss during the pandemic, and these outcomes should be monitored in the medium and longer term, as consequences of the economic and health disruptions are realised and protective policies are lifted. It is also plausible that participants who experienced adverse housing disruptions (e.g. homelessness) were less likely to participate in the COVID-19 surveys and might not be represented in these findings.

Across the included cohorts, around 25–45% of individuals reported at least one kind of disruption, with a further 2–30% across cohorts experiencing two out of three and a smaller proportion (0.2–6.5%) experiencing all three. The heightened risk for clusters of disruptions for those with psychological distress may be largely a result of the increased risk of disruptions to healthcare, economic activity and income, as that, combined with no difference in risk for housing disruptions, will still mean clusters of disruptions are more likely. Furthermore, adverse outcomes may cluster; for example, with housing disruption resulting from employment loss, or those with poor mental health being more likely to experience healthcare disruptions as a result of moving home and general practice.[36] Multiple adverse disruptions are potentially predictive of poorer prognosis longer term.[37] We found that those with prior mental distress were more likely to suffer multiple disruptions, highlighting the need for inter-agency working in supporting those with mental ill health.

Strengths and limitations

The analysis of multiple longitudinal cohorts with rich pre-COVID-19 information is an important strength of this study. Although many COVID-19-era online studies are available, the lack of pre-pandemic information makes it difficult to untangle the directions of associations between mental health and other outcomes. However, in the current study, information on pre-pandemic healthcare use and disruptions were not consistently available across studies, so observed associations between pre-pandemic psychological distress and healthcare disruption may reflect being more likely to have healthcare needs to disrupt. This study is also strengthened by coordinated primary analysis in multiple longitudinal studies with differing study designs, different target populations and varying selection and attrition processes. Heterogeneity in our meta-analysed estimates were often reduced when considering models with a greater number of possible confounders, highlighting the importance of adjusting for relevant pre-pandemic characteristics as appropriate for different generations and cohorts.

Differences between studies in a range of factors, including measurement of mental health and outcomes, timing of surveys, design, response rates and differential selection into the COVID-19 sweeps, are potentially responsible for heterogeneity in estimates. However, despite this heterogeneity in the magnitude of estimates, the key findings were fairly consistent with regards to the direction of association across most studies. The differences might also be positively construed as allowing for replication and triangulation of findings that are robust to these intrinsic differences between studies. Furthermore, this heterogeneity can be informative; for example, by virtue of the mix of age-specific and age-range cohorts we could determine that the observed association between pre-pandemic psychological distress and disruptions does not differ by age.

Implications and conclusions

Our findings highlight that people with poor mental health before the start of the pandemic were more likely to suffer negative economic and healthcare consequences in the first year of the pandemic, highlighting the need for policy makers to take this into account when provisioning current and post-pandemic health, economic and well-being support. For instance, processes for re-booking healthcare procedures or accessing economic support should ensure that people struggling with mental health difficulties do not face additional barriers to accessing resources. Primary care practitioners and pharmacists should monitor patients with known mental health difficulties to ensure they do not miss appointments, procedures or prescriptions.

Individuals with mental health difficulties were more likely to have experienced adverse healthcare, economic and housing outcomes even before the pandemic.[7,9] The pandemic created a situation where these disruptions were occurring at far greater rates than in a usual year. Given the far greater frequency of these disruptions in the population during COVID-19, the effects on those with existing poor mental health will have been consequently larger.

Individuals with more severe mental disorders (e.g. schizophrenia, eating disorders), may have experienced even greater adversity from these disruptions, particularly in housing and economic domains. However, low prevalence of severe disorders generally leaves population-based samples underpowered to consider such conditions. Efforts to understand the effects of the pandemic on those with more severe mental disorders is lacking, but needed. Current evidence suggests that they are at even greater risk of COVID-19 infection, mortality and non-vaccination uptake.[5,8]

Our findings highlight that many adverse socioeconomic and health impacts of the pandemic have been disproportionately faced by those with prior mental ill health, who are more likely to be women, those without a degree and younger generations. The pandemic has the potential to increase social exclusion and widen existing physical health and economic inequalities among those with mental ill-health, and mitigating this should be a public health priority. Ongoing monitoring is needed to get a full picture of the health and socioeconomic implications of the pandemic for those with mental health difficulties.

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First received 14 Jun 2021, final revision 2 Aug 2021, accepted 2 Aug 2021

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press

Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1192/bjp.2021.132

Data availability

All data-sets included in this analysis have established data-sharing processes, and the anonymised data-sets for most of the included studies, with corresponding documentation, can be downloaded for use by researchers from the UK Data Service. We have detailed the exact processes for each data-set in Supplementary File 2.

Author contributions

P.P, D.J.P. and N.C. conceptualised the study and design. P.P., M.J.G., E.J.T., G.D.G., E.M., J. Maddock, S.V.K., C.L.N., G.J.G., A.S.F.K. and R.J.S. designed the methodology. M.J.G., E.J.T., G.D.G., E.M., J. Maddock, A.J.S., H.L.D., J. Mundy, G.J.G. and A.S.F.K. conducted the formal analysis. M.J.G., E.J.T., G.D.G., E.M., J. Maddock, A.J.S., G.J.G., A.S.F.K., C.J.S., N.C., M.H. and E.F. were responsible for data curation. P.P., M.J.G., G.D.G. and J. Maddock wrote the original draft of the manuscript. All authors contributed to critical revision of the manuscript. E.J.T., G.D.G. and J. Maddock contributed to data visualisation. The project was supervised by P.P., D.J.P. and S.V.K. Funding was acquired by P.P., S.V.K., G.B., D.J.P., A.S., G.B.P., R.J.S., C.J.S. and N.C.

Acknowledgements

The contributing studies have been made possible because of the tireless dedication, commitment and enthusiasm of the many people who have taken part. We would like to thank the participants and the numerous team members involved in the studies, including interviewers, technicians, researchers, administrators, managers, health professionals and volunteers. We are additionally grateful to our funders for their financial input and support in making this research happen. GLAD: Alish Palmos, Christopher Hübel, Molly R. Davies, Henry C. Rogers, Yuhao Lin, Katherine S. Young, Thalia Eley, Matthew Hotopf, Kirstin Purves, Nathalie Kingston, John Bradley, Sofia Papadia, Debbie Clapham-Riley and Neil Walker. Generation Scotland: Drew Altschul, Chloe Fawns-Ritchie, Archie Campbell and Robin Flaig. ALSPAC: Daniel J. Smith, Nicholas J. Timpson and Kate Northstone. USOC: Michaela Benzeval. NSHD: Andrew Wong, Maria Popham, Karen MacKinnon, Imran Shah and Philip Curran. MCS, Next Steps, BCS70 and NCDS: colleagues in survey, data and cohort maintenance teams. TwinsUK: Rachel Horsfall, Gulsah Akdag, Paz García, Darioush Yarand and Deborah Hart.

Funding

This work was supported by the National Core Studies, an initiative funded by UK Research and Innovation, National Institute for Health Research and the Health and Safety Executive. The COVID-19 Longitudinal Health and Wellbeing National Core Study was funded by the Medical Research Council (grant MC_PC_20030). Funding statements for each included dataset are available in Supplementary File 2.

Declaration of interest

No conflicts of interest were declared by D.J.P., E.J.T., G.D.G., A.S., P.P., E.M., M.J.G., H.L.D., J. Maddock, J. Mundy, C.L.N., A.S.F.K., G.J.G., A.J.S., M.H., R.J.S., C.J.S., E.F. and G.B.P. S.V.K. is a member of the Scientific Advisory Group on Emergencies subgroup on ethnicity and COVID-19, and is co-chair of the Scottish Government's Ethnicity Reference Group on COVID-19. G.B. is an advisory board member for Otsuka Ltd and Compass Pathways. N.C. serves on a data safety monitoring board for trials sponsored by AstraZeneca.

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EXTRA CONTENT ONLINE

Poem

Lacrimation

Richard Kravitz

It's a good word to have around
(From the Latin, of course.
Lachrymose is prettier, that c-h-r-y!
and the heartbreaking *lacrimosa—)*
because how else are you going to describe what happens
when you chop onions (propanethiol S-oxide is the culprit),
and you start to tear up.
It can get bad enough (even your nose starts to run)
that you feel sad, like a good method actor,
or a child.

And then there's heroin withdrawal.
That can get intense: sneezes and sweats,
hair on end, agonizing spasm and pain,
a feeling that leaves you whimpering,
curled up in fetal position, ready to die
or steal.

Hay fever can do it too, seasonal allergies,
turning joyous spring into a runny, mucusy mess,
tortoise tears streaming past leporine laughter.

Or when the military veteran, young or old,
tells you about his service, where and when,
and then, eyes wide in alarm,
remembers whom he left on the field,
whom, still now, he needs to bring home,
Mary, weeping all the world's tears,
Cradling her child spilled over her arms.

Oh, and the forgotten child,
hurt and hidden so many years,
huddled within. How would we find you,
know you're still alive,
without the wet of unbidden tears?

The British Journal of Psychiatry (2022) 220, 30. doi: 10.1192/bjp.2021.117

https://doi.org/10.1192/bjp.2021.132 Published online by Cambridge University Press