

Risk and protective factors for new onset binge eating, low weight, and self-harm symptoms in >25,000 individuals in the UK during the COVID-19 pandemic

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Keywords: eating disorders, suicidal ideation, mental health, psychiatric disorders, comorbidity

Abstract

Objective: The disruption caused by the COVID-19 pandemic has been associated with poor mental health, including increases in eating disorder and self-harm symptoms. We investigated risk and protective factors for new onset of these symptoms during the pandemic.

Method: Data were from the COVID-19 Psychiatry and Neurological Genetics study and the Repeated Assessment of Mental health in Pandemics Study ($n = 45,058$). Exposures were socio-demographic characteristics, lifetime psychiatric disorder, and COVID-related variables, including SARS-CoV-2 infection/illness with COVID-19. We identified four sub-samples of participants without pre-pandemic experience of our outcomes: binge eating ($n = 18,172$), low weight ($n = 19,148$), suicidal and/or self-harm ideation ($n = 12,650$), and self-harm ($n = 20,266$). Participants reported on our outcomes at frequent intervals (fortnightly to monthly). We fitted four logistic regression models to identify factors associated with new onset of our outcomes.

Results: Within each subsample, new onset was reported by: 16.9% for binge eating, 8.9% for low weight, 26.6% for suicidal and/or self-harm ideation, and 3.3.% for self-harm. Shared risk factors included having a lifetime psychiatric disorder, not being in paid employment, and higher pandemic worry scores. Conversely, infection with SARS-CoV-2/illness with COVID-19 was linked to lower odds of all outcomes. Other factors were associated with one outcome, such as pandemic-related loneliness with suicidal and/or self-harm ideation.

Discussion: Overall, we detected shared risk factors that may drive the comorbidity between eating disorders and self-harm. Subgroups of individuals with these risk factors may require more frequent monitoring during future pandemics.

Public significance statement

In a sample of 25,000 UK residents, people who had a psychiatric disorder, were not in paid employment, or were more worried about the pandemic were more likely to experience binge eating, low weight, suicidal and/or self-harm ideation, and self-harm for the first time during the pandemic. People with these risk factors may need particular attention during future pandemics to enable early identification of new psychiatric symptoms.

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FIGURE 1 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic derived from multiple logistic regression models ($n = 18,172$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

FIGURE 2 Association between demographic and COVID-related variables and new onset of low weight during the pandemic derived from multiple logistic regression models ($n = 19,148$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

FIGURE 3 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic derived from multiple logistic regression models ($n = 12,650$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

FIGURE 4 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic derived from multiple logistic regression models ($n = 20,266$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

1 Introduction

During the COVID-19 pandemic, people living in the UK, as in many other countries, were ordered to stay at home and apply limits to social contact during multiple national and local lockdowns. In its early stages, researchers highlighted that the environment generated by the pandemic was likely to exacerbate eating disorders¹. In January 2021, the UK's largest eating disorder charity, Beat, reported a 173% increase in demand for their helpline services in comparison with February 2020². The picture is less clear for self-harm, with some papers reporting a decrease^{3,4} and others an increase⁵ during the pandemic.

Self-harm and eating disorders are both body-focussed illnesses⁶, argued to be disorders of emotion regulation^{7,8} and forms of self-punishment⁹. Reports indicate that up to 72% of people with an eating disorder self-harm without suicidal intent, and 25-54% of people who self-harm report co-occurrent eating disorder symptoms⁶. Similarly, having eating disorder symptoms has been associated with a minimum two-fold increased likelihood of reporting self-harm ideation¹⁰ and approximately one-quarter of people with an eating disorder report experiencing suicidal ideation whilst unwell¹¹⁻¹³. Shared risk factors may drive their comorbidity, for example, personality traits such as negative urgency¹⁴⁻¹⁹.

Compared to before the COVID-19 pandemic, higher instances of binge eating have been reported during the pandemic by both individuals in the general population²⁰ and patients with a history of binge-eating disorder²¹. In non-clinical samples, being female was identified as a risk factor for pandemic-related binge eating²² and feeling more out of control when eating²³, a key component of binge eating. During the pandemic, those suffering from symptoms of other psychiatric disorders and lockdown-related stress have also been reported to be at increased risk of binge eating²². In terms of other eating disorder symptoms, being at a low weight, typically considered to be a body mass index below 18.5 kg/m², is a core symptom of anorexia nervosa²⁴. A systematic review of studies of both general population participants and patients, for instance, those attending an obesity clinic, found that 11-32% of participants experienced weight loss during the pandemic; stress and previous low weight were suggested contributing factors²⁵. In line with this, self-reported reduction in quantities eaten during lockdown has been linked with stress^{22,26}, as well as with being female^{22,26} and higher scores on measurements of depression²⁶.

Data from the COVID-19 Social Study, which explored the experiences of ~75,000 UK adults during the COVID-19 pandemic, indicated that over the first 59 weeks of the pandemic, over one-quarter of participants reported self-harm ideation and 8% reported they had self-harmed at least once²⁷. However, this may not represent population prevalence as the sample was self-selected²⁸. In almost 50% of 228 UK patients presenting to hospital after self-harm, COVID-related factors such as loneliness and entrapment were identified as contributing factors²⁹. Indeed, a study of 49,324 UK adults found that experience of each pandemic-related adverse event, such as financial difficulties, being ill with COVID-19, or the death or illness of a family member or friend, was associated with an approximately two-fold higher likelihood of self-reported self-harm and a 1.56 times higher odds of self-reported self-harm ideation²⁷. With

regards to self-reported suicidal ideation, being younger^{30,31}, gender diverse³², of a lower socioeconomic group³⁰, lower income³³, unstable employment³¹, and having pre-existing mental ill-health^{30–33} have been associated with higher risk during the pandemic.

Establishing common and distinct risk factors for new onset of eating disorder and self-harm symptoms during the pandemic may help to identify subgroups that require closer monitoring of their mental health during future pandemics. Additionally, disentangling the complex relationship between these symptoms through shared risk and protective factors will contribute to our understanding of the possible mechanisms underlying their comorbidity. We examined the longer-term effects of the COVID-19 pandemic based on UK data collected between April 2020 and July 2021. We investigated whether a range of potential risk factors were longitudinally associated with newly occurring binge eating, low weight, suicidal and/or self-harm ideation, or self-harm during the pandemic.

We hypothesised that those groups already at risk of disordered eating - such as women³⁴ - or of self-harm thoughts and behaviours - such as younger individuals³⁵ - would be at higher risk of newly experiencing these symptoms during the pandemic. Further, we hypothesised that individuals who experienced COVID-related difficulties, for example, the loss of a loved one due to COVID, would also be more at risk of these mental health difficulties during the pandemic. Finally, given the high overlap of self-harm thoughts and behaviours and eating disorders^{6,10–13,36}, we hypothesised that there would be common risk factors across all outcomes.

2 Method

2.1 Sample

Participants were from the Repeated Assessment of Mental health in Pandemics (RAMP) Study ($n = 12,162$) and a subsample of the National Institute for Health and Care Research (NIHR) BioResource who joined the COVID-19 Psychiatry and Neurological Genetics (COPING) study ($n = 32,896$).

RAMP Study. The RAMP Study was set up in April 2020 to better understand the impact of the COVID-19 pandemic on the mental health and well-being of UK residents. Recruitment was entirely online, via a social media campaign. Participants completed a baseline assessment and subsequent follow-up questionnaires fortnightly until July 2020 and then monthly. The RAMP Study questionnaires largely mirror those in the COPING study. Our study includes all RAMP Study data collected between April 2020 and July 2021.

NIHR BioResource. The NIHR BioResource is a databank and recontactable resource of volunteers who have provided medical, clinical, and biological data. Volunteers were recruited via a variety of approaches, including NHS blood transfusion services and various disease/disorder focussed research efforts.

Throughout the pandemic, NIHR BioResource participants were given the opportunity to join the COPING study, which launched in April 2020. The COPING study contained questionnaires from the sign-up surveys of the Genetic Links to Anxiety and Depression (GLAD) Study³⁷ and the Eating Disorders Genetics Initiative (EDGI UK) as well as additional questionnaires to assess COVID-related variables, i.e., experiences related to the COVID-19 pandemic. Participants first completed a baseline survey and then follow-up surveys, initially every two weeks but then monthly from August 2020. Details are described elsewhere³⁸. Our study includes all COPING study data collected between April 2020 and July 2021.

COPING study participants come from multiple sub-cohorts of the NIHR BioResource, including: the GLAD Study ($n = 14,948$); EDGI UK ($n = 1,010$); the Inflammatory Bowel Disease BioResource ($n = 3,203$); NHS blood and transplant studies, including INTERVAL ($n = 4,656$), COMPARE ($n = 1,928$), and STRategies to Improve Donor Experiences (STRIDES; $n = 2,808$); and the Research Tissue Bank - Generic ($n = 4,343$). Saliva samples for DNA have not been provided by all participants of the GLAD Study or EDGI UK and therefore some participants are not full members of either study. Therefore, we refer to these participants as GLAD survey participants and EDGI UK survey participants. Further detail about these cohorts is in Table 1, with numbers of participants after exclusion.

2.2 Ethical approval

The London - Fulham Research Ethics Committee approved the GLAD Study on 21st August 2018 (REC reference: 18/LO/1218) and EDGI UK on 29th July 2019 (REC reference: 19/LO/1254). The NIHR BioResource has been approved as a Research Tissue Bank by the East of England - Cambridge Central Committee (REC reference: 17/EE/0025). The COVID-19 Psychiatry and Neurological Genetics study was approved by the South West - Central Bristol Research Ethics Committee on 27th April 2020 (REC reference: 20/SW/0078). The RAMP Study was approved by the Psychiatry, Nursing and Midwifery Research Ethics Committee at King's College London on 27th March 2020 (HR-19/20-18157).

2.3 Measures

A detailed summary of how we defined exposure and outcome variables is in the Supplementary Materials. We defined each ‘phase’ as the time period starting from the date one survey was distributed and ending the day before the next survey was distributed.

2.3.1 Exposures

Socio-demographic variables. Socio-demographic information including age, race/ethnicity, sex, gender, and employment status was collected from the COPING study and RAMP Study baseline surveys, and the GLAD Study and EDGI UK sign-up surveys. We collapsed race and gender categories into binary variables of ‘racially minoritised’ and ‘minoritised gender’, respectively. Sample sizes in the more refined racial and gender groups were too small to keep them as independent categories.

Psychiatric disorders. We assessed lifetime mental health diagnoses via the Mental Health Diagnosis questionnaire (MHD), adapted from the UK Biobank Questionnaire³⁹. This includes questions such as: *‘Have you been diagnosed with one or more of the following mental health problems by a professional, even if you don’t have it currently?’*, followed by a list of psychiatric disorders. The MHD was included in the RAMP Study baseline survey and the GLAD Study and EDGI UK sign-up surveys. The MHD was also included in the baseline COPING study questionnaire for all sub-cohorts other than EDGI UK because the launch dates of EDGI UK and the COPING study were less than three months apart. We additionally identified participants with algorithm-derived lifetime eating disorder diagnoses via responses to the ED100K⁴⁰.

COVID-related variables. We measured pandemic worry scores (via a non-validated 21-item scale developed by the RAMP Study team), being a vulnerable group member, and pandemic-related loneliness in the COPING study and the RAMP Study baseline surveys.

The remaining exposure variables were measured beyond the baseline assessment, i.e., at frequent intervals during the monitoring period. This included: COVID-19 illness or positive test, loss of a loved one or relative due to COVID-19, change in main economic activity (work or education), and change in living situation. We only included instances in which the first report of the exposure occurred in the same phase as or in a phase before the first report of the outcome.

2.3.2 Outcomes

Participants with no pre-pandemic experience of each outcome form the basis of our analysis. Participants self-reported pre-pandemic experience of self-harm-related outcomes in the COPING study and RAMP Study baseline surveys (e.g., *“Many people have thoughts that life is not worth living. Had you felt that way before the pandemic?”*). Contrastingly, participants were not explicitly asked about pre-pandemic experience of binge eating or low weight. GLAD survey and EDGI UK survey participants who answered the relevant sign-up questionnaire up to three months before the pandemic and who did not endorse lifetime low weight and/or binge eating

or a related lifetime diagnosis were classified as not having pre-pandemic experience. For participants who answered the COPING study baseline survey during the pandemic and who endorsed lifetime low weight and/or binge eating, we cross-checked their age at symptom start with their age at the start of the pandemic. Participants for whom their age at symptom start was older than their age at the start of the pandemic were classified as not having pre-pandemic experience of the symptom. RAMP Study participants self-reported diagnoses of anorexia nervosa, psychological overeating or binge-eating disorder, and bulimia nervosa, as well as binge eating in the 28 days before the pandemic. Participants without a diagnosis of anorexia nervosa were classified as not having pre-pandemic experience of low weight, whilst those without a binge-type eating disorder diagnosis and who indicated they did not binge eat in the 28 days before the pandemic were classified as not having pre-pandemic experience of binge eating. See Supplementary materials for full details.

Binge eating. Binge eating was assessed via the ED100K⁴⁰, an eating disorder questionnaire which asks questions about a range of DSM-5²⁴ eating disorder symptoms and enables the identification of algorithmically-derived eating disorder cases. Binge eating was assessed via the ED100K⁴⁰ screener question included at baseline and every other follow-up survey in the RAMP Study and the COPING study survey: *‘Over the past month, have you had regular episodes of overeating or eating binges when you ate what most people would regard as an unusually large amount of food in a short period of time?’*. Participants with no pre-pandemic experience of binge eating and who endorsed binge eating at any point during the monitoring period were classified as having new onset binge eating.

Low weight. Low weight was assessed via the ED100K⁴⁰ screener question included at baseline and every other follow-up in the RAMP Study and the COPING study: *‘Over the past month, have you weighed much less than other people thought you ought to weigh?’*. Again, participants with no pre-pandemic experience of low weight and who, at any point during the monitoring period, endorsed low weight were classified as having new onset low weight.

Suicidal and/or self-harm ideation. The thoughts and feelings questionnaire (TAF) was adapted from the UK Biobank³⁹ and was included at baseline and every follow-up in the RAMP Study and the COPING study. The TAF includes questions investigating pre-pandemic, lifetime, and recent (past two weeks) passive suicidal ideation (e.g., *‘Many people have thoughts that life is not worth living. Have you felt that way in the past two weeks?’*) and self-harm ideation (e.g., *‘Have you contemplated harming yourself in the past two weeks?’*). We combined ‘suicidal ideation’ and ‘self-harm ideation’ because preprocessing checks revealed a correlation of 0.86 (Supplementary Figure 1).

Participants with no pre-pandemic experience of either symptom and who then endorsed recent or lifetime suicidal and/or self-harm ideation during the monitoring period were categorised as having new onset suicidal and/or self-harm ideation.

Self-harm. The question *‘In the last two weeks, have you deliberately harmed yourself, whether or not you meant to end your life?’* was included in the TAF at baseline and every follow-up. Participants with no pre-pandemic experience of self-harm and who endorsed self-harm during the monitoring period were classified as having new onset self-harm.

For all exposures, participants who answered 'No' at least once and never answered 'Yes' to experiencing the relevant outcome were categorised as having not experienced the outcome during the monitoring period.

2.4 Exclusion criteria

We excluded a total of 19,646 participants with missing data on any exposure variable and/or all outcome variables, leaving a total of 25,412 participants for inclusion in data analysis. See Supplementary Tables 1a and 1b for details.

TABLE 1 The Repeated Assessment of Mental health in Pandemics (RAMP) Study and the COPING study participants divided by the sub-cohorts of the National Institute for Health and Care Research (NIHR) BioResource comprising the analysis samples ($n = 25,412$).

	N	Recruitment methods	Eligibility criteria	Recruitment area
Repeated Assessment of Mental Health in Pandemics (RAMP) Study	5,024	Social media	16+ years, live in the UK	England, Wales, Scotland, Northern Ireland
Genetic Links to Anxiety and Depression (GLAD) Study	8,586	Social media, NHS recruitment sites	16+ years, live in the UK, lifetime experience of anxiety and/or depression	England, Wales, Scotland, Northern Ireland
Eating Disorders Genetics Initiative (EDGI UK)	384	Social media	16+, live in England, have lifetime experience of any eating disorder	England
Inflammatory Bowel Disease (IBD) cohort	1,764	IBD clinics in participating hospitals across the UK	16+, have a diagnosis of Crohn's disease, ulcerative colitis, indeterminate colitis, IBD type unspecified, or suspected IBD	England, Wales, Scotland, Northern Ireland
NHS Blood and Transplant studies (COMPARE, STRIDES, INTERVAL)	6,678	Blood donation centres	16+, live in England	England

Research Tissue Bank - Generic (RTB-GEN)	2,976	Biomedical Research Centres, Clinical Research Facilities, hospital clinics, community recruitment, online	16+, live in England	England
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2.5 Data analysis

We conducted all analyses in R version 4.1.2⁴¹. All code for this study is publicly available: https://github.com/RAMP-COPING/EDBehaviour_SelfHarm.

Preprocessing. We assessed multicollinearity by calculating the correlation between all exposure variables included in each regression model (Supplementary Figures 2-5). Correlations above 0.7 violated our assumption of no multicollinearity.

Descriptives. First, we described the age, sex, gender, race/ethnicity, body mass index (BMI; at registration), and education level of the overall sample ($n = 25,412$) and each subsample with complete data on all relevant variables, defined by outcome: binge eating ($n = 18,172$), low weight ($n = 19,148$), suicidal and/or self-harm ideation ($n = 12,650$), and self-harm ($n = 20,266$). Second, we described the percentage of participants in each subsample that self-reported new onset of each symptom during the monitoring period, both in the main analysis and all sensitivity analyses.

Regression analysis. We fitted four multiple logistic regression models to estimate associations between our exposure variables and new onset of 1) binge eating, 2) low weight, 3) suicidal and/or self-harm ideation, and 4) self-harm. We regressed each outcome onto all exposure variables using the *glm* function from the *stats* package. We plotted results using the *or_plot* function from the *finalfit* package. We controlled for multiple testing by using a p -value threshold adjusted for the number of variables included in each model ($\alpha = \frac{0.05}{13} = 0.0038$).

Sensitivity analyses. First, we restricted our analyses to participants who were not originally ascertained for psychiatric disorders (i.e., excluded GLAD and EDGI UK survey participants). In a second sensitivity analysis, we excluded all participants from the IBD sub-cohort and those who self-reported a diagnosis of IBD. We conducted a third sensitivity analysis in which we specified that participants must have answered ‘No’ at least three times to be categorised as having not experienced the relevant outcome, to assess the influence of missing data. In a fourth sensitivity analysis, we dropped all instances in which the exposure was first reported in the same phase as the outcome, with the aim to further limit the possibility of the outcome impacting the exposures. Fifth, we included ‘education level’ as an exposure and dropped all participants in the age group 16-25; participants in this age group may not have finished their education and thus we were unable to include ‘education level’ as an exposure in the main analysis. Finally, given the well-documented association between obsessive-compulsive disorder (OCD) and anorexia⁴², we included the screener questions to the baseline Obsessive-Compulsive Inventory Revised (OCI-R⁴³) as exposures in our regression model with low weight as the outcome.

3 Results

3.1 Descriptives

Both the entire sample and every subsample defined by outcome consisted of majority white (97-98%), female (64-70%), highly educated (e.g., over 50% of participants had at least a Bachelor's degree) participants (Table 2). The most common age category was 56-65 years (27-30%). Within each subsample, new onset was reported by: 16.9% for binge eating, 8.9% for low weight, 26.6% for suicidal and/or self-harm ideation, and 3.3% for self-harm (Table 3). In our sensitivity analyses, these percentages changed only marginally.

TABLE 2 Characteristic of the sample after exclusion ($n = 25,412$) and of each subsample defined by outcome: binge eating ($n = 18,172$), low weight ($n = 19,148$), suicidal and/or self-harm ideation ($n = 12,650$), and self-harm ($n = 20,266$). Participants are from the National Institute for Health and Care Research (NIHR) BioResource sub-cohorts who joined the Covid-19 Psychiatry and Neurological Genetics (COPING) Study, or the Repeated Assessment of Mental health in Pandemics (RAMP) Study. Participants reported new onset of each symptom in the COPING study or the RAMP Study.

	Sample after exclusion	Binge eating	Low weight	Suicidal and/or self- harm ideation	Self-harm
Total (n)	25,412	18,172	19,148	12,650	20,266
Age (years)					
16-25	1,499 (5.9%)	883 (4.9%)	942 (4.9%)	427 (3.4%)	706 (3.5%)
26-35	3,057 (12.0%)	1,717 (9.4%)	2,108 (11.0%)	1,056 (8.3%)	1,833 (9.0%)
36-45	3,467 (13.6%)	2,101 (11.6%)	2,387 (12.5%)	1,380 (10.9%)	2,444 (12.1%)
46-55	5,387 (21.2%)	3,684 (20.3%)	4,003 (20.9%)	2,520 (19.9%)	4,360 (21.5%)
56-65	6,736 (26.5%)	5,201 (28.6%)	5,303 (27.7%)	3,758 (29.7%)	5,978 (29.5%)
66-70	2,750 (10.8%)	2,350 (12.9%)	2,282 (11.9%)	1,808 (14.3%)	2,554 (12.6%)
71+	2,516 (9.9%)	2,236 (12.3%)	2,123 (11.1%)	1,701 (13.4%)	2,391 (11.8%)
Assigned sex at birth					
	17,876 (70.3%)	12,002 (66.0%)	13,060 (68.2%)	8,134 (64.3%)	13,577 (67.0%)
Female					
Male	7,536 (29.7%)	6,170 (34.0%)	6,088 (31.8%)	4,516 (35.7%)	6,689 (33.0%)
Minoritised gender					
Yes	255 (1.0%)	143 (0.8%)	172 (0.9%)	49 (0.4%)	113 (0.6%)
No	25,157	18,029	18,970	12,601 (99.6%)	20,153

	(99.0%)	(99.2%)	(99.1%)		(99.4%)
Education level					
No formal qualifications	617 (2.4%)	486 (2.7%)	463 (2.4%)	391 (3.1%)	547 (2.7%)
GCSE/CSE or equivalent	2,517 (9.9%)	1,851 (10.2%)	1,915 (10.0%)	1,348 (10.7%)	2,053 (10.1%)
NVQ, HND, HNC or equivalent	1,497 (5.9%)	1,076 (5.9%)	1,046 (5.5%)	832 (6.6%)	1,255 (6.2%)
A-Levels or equivalent	3,655 (14.4%)	2,467 (13.6%)	2,692 (14.1%)	1,658 (13.1%)	2,716 (13.4%)
Other professional qualification	2,215 (8.7%)	1,630 (9.0%)	1,646 (8.6%)	1,267 (10.0%)	1,889 (9.3%)
Bachelor's degree or equivalent	7,697 (30.3%)	5,484 (30.2%)	5,904 (30.8%)	3,739 (29.6%)	6,054 (29.9%)
Master's degree or equivalent	3,024 (11.9%)	2,163 (11.9%)	2,320 (12.1%)	1,393 (11.0%)	2,373 (11.7%)
Postgraduate degree or equivalent	3,122 (12.3%)	2,194 (12.1%)	2,354 (12.3%)	1,512 (12.0%)	2,517 (12.4%)
PhD	1,060 (4.2%)	816 (4.5%)	801 (4.2%)	506 (4.0%)	854 (4.2%)
Race/ethnicity					
Arab	11 (<0.1%)	6 (<0.1%)	9 (<0.1%)	5 (<0.1%)	7 (<0.1%)
Asian	205 (0.8%)	138 (0.8%)	142 (0.7%)	93 (0.7%)	165 (0.8%)
Black	104 (0.4%)	73 (0.4%)	82 (0.4%)	55 (0.4%)	84 (0.4%)
Mixed race	296 (1.2%)	175 (1.0%)	202 (1.1%)	91 (0.7%)	183 (0.9%)
Other	134 (0.5%)	78 (0.4%)	89 (0.5%)	46 (0.4%)	101 (0.5%)
White	24,662 (97.0%)	17,702 (97.4%)	18,624 (97.3%)	12,360 (97.7%)	19,726 (97.3%)
BMI [kg/m2] (median, IQR)*					
At registration	29.1 (8.2)	28.2 (7.1)	29.8 (8.2)	28.7 (7.3)	29.0 (7.6)

Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; GCSE/CSE = General Certificate of Secondary Education/Certificate of Secondary Education, NVQ = National

Vocational Qualification, HND = Higher National Diplomas, HNC = Higher National Certificates; BMI = body mass index; IQR = interquartile range. *BMI data were not normally distributed (Supplementary Figure 6) so we reported median and IQR.

TABLE 3 Number and percentage of participants with new onset in each of the subsamples defined by outcome: binge eating, low weight, suicidal and/or self-harm ideation, and self-harm in the main analysis and each sensitivity analysis. Participants are from National Institute for Health and Care Research (NIHR) BioResource sub-cohorts who joined the COVID-19 Psychiatry and Neurological Genetics (COPING) study, or the Repeated Assessment of Mental health in Pandemics (RAMP) Study. Participants reported new onset of each symptom in the COPING study or the RAMP Study.

N with new onset between April 2020 and July 2021 (%)				
	Binge eating	Low weight	Suicidal and/or self-harm ideation	Self-harm
Main analysis	3,064/18,172 (16.9%)	1,701/19,148 (8.9%)	3,366/12,650 (26.6%)	661/20,266 (3.3%)
Sensitivity analysis A	2,031/13,240 (15.3%)	1,162/13,473 (8.6%)	2,046/10,401 (19.7%)	346/14,656 (2.4%)
Sensitivity analysis B	2819/16,502 (17.1%)	1,555/17,825 (8.7%)	3079/11,254 (27.4%)	622/18,238 (3.4%)
Sensitivity analysis C	3,064/16,332 (18.8%)	1,701/16,804 (10.1%)	4,500/13,082 (34.4%)	780/18,758 (4.2%)
Sensitivity analysis D	2,730/17,861 (15.3%)	1,498/18,979 (7.9%)	3,635/13,002 (28%)	734/19,054 (3.9%)
Sensitivity analysis E	2,895/17,284 (16.8%)	1,583/18,199 (8.7%)	4,230/12,878 (32.9%)	702/18,552 (3.8%)
Sensitivity analysis F	NA	1,458/16,345 8.9%	NA	NA

Note. Sensitivity analysis A = analysis in which we excluded participants ascertained for having a psychiatric disorder, i.e., EDGI UK and GLAD survey participants; Sensitivity analysis B = analysis in which we excluded participants with inflammatory bowel disease; Sensitivity analysis C = analysis in which we specified that participants must have answered 'No' at least three times to be classified as having not experienced the relevant outcome during the monitoring period; Sensitivity analysis D = analysis in which we dropped all instances in which the exposure was first reported in the same phase or a phase after the first report of the outcome; Sensitivity analysis E = analysis in which we included education as an exposure and dropped participants aged 16-25; Sensitivity analysis F = analysis in which we included OCD symptoms as an exposure in the model with low weight as the outcome.

3.2 Regression analysis results

Below we have categorised risk and protective factors as ‘shared’ (i.e., across eating disorder and self-harm symptoms) or ‘specific’ (i.e., relating to either eating disorder or self-harm symptoms). For each subsample, we have provided information on the n of each exposure split by outcome in Supplementary Tables 2-5.

Shared risk factors. A lifetime psychiatric disorder was associated with higher odds of new onset binge eating (Figure 1), low weight (Figure 2), suicidal and/or self-harm ideation (Figure 3), and self-harm (Figure 4) during the pandemic. Another shared risk factor was pandemic worry; higher pandemic worry scores were associated with higher odds of binge eating, low weight, suicidal and/or self-harm ideation, and self-harm. Compared to being in paid employment, not being in paid employment was linked with higher odds of binge eating, low weight, and suicidal and/or self-harm ideation.

Shared protective factors. A shared protective factor was a change in living situation, which was associated with lower odds of binge eating, low weight, and suicidal and/or self-harm ideation. We found that infection with COVID-19 was associated with lower odds of all outcomes. Compared to participants in mid-life (46-55 years), the odds of binge eating and self-harm were lower in older participants, 71+ years and 56-65 years, respectively.

Specific risk factors. Being a member of a vulnerable group, such as organ transplant recipients, was linked to higher odds of low weight. Compared to being female, being male was associated with higher odds of low weight. Self-reporting greater loneliness during the pandemic than before the pandemic was linked to higher odds of suicidal and/or self-harm ideation. Compared to being in mid-life, being aged 16-25 or 26-35 years was associated with higher odds of suicidal and/or self-harm ideation and self-harm. Compared to being in other paid employment, being a key worker, such as working in health and social care, was linked to higher odds of binge eating and low weight, and being a student was associated with higher odds of low weight.

Specific protective factors. Loss of a loved one or relative due to COVID-19 was associated with a reduction in the odds of suicidal and/or self-harm ideation. Compared to being in mid-life, being younger (26-35 years) was associated with lower odds of low weight.

New onset binge eating during pandemic: OR (95% CI, p-value)

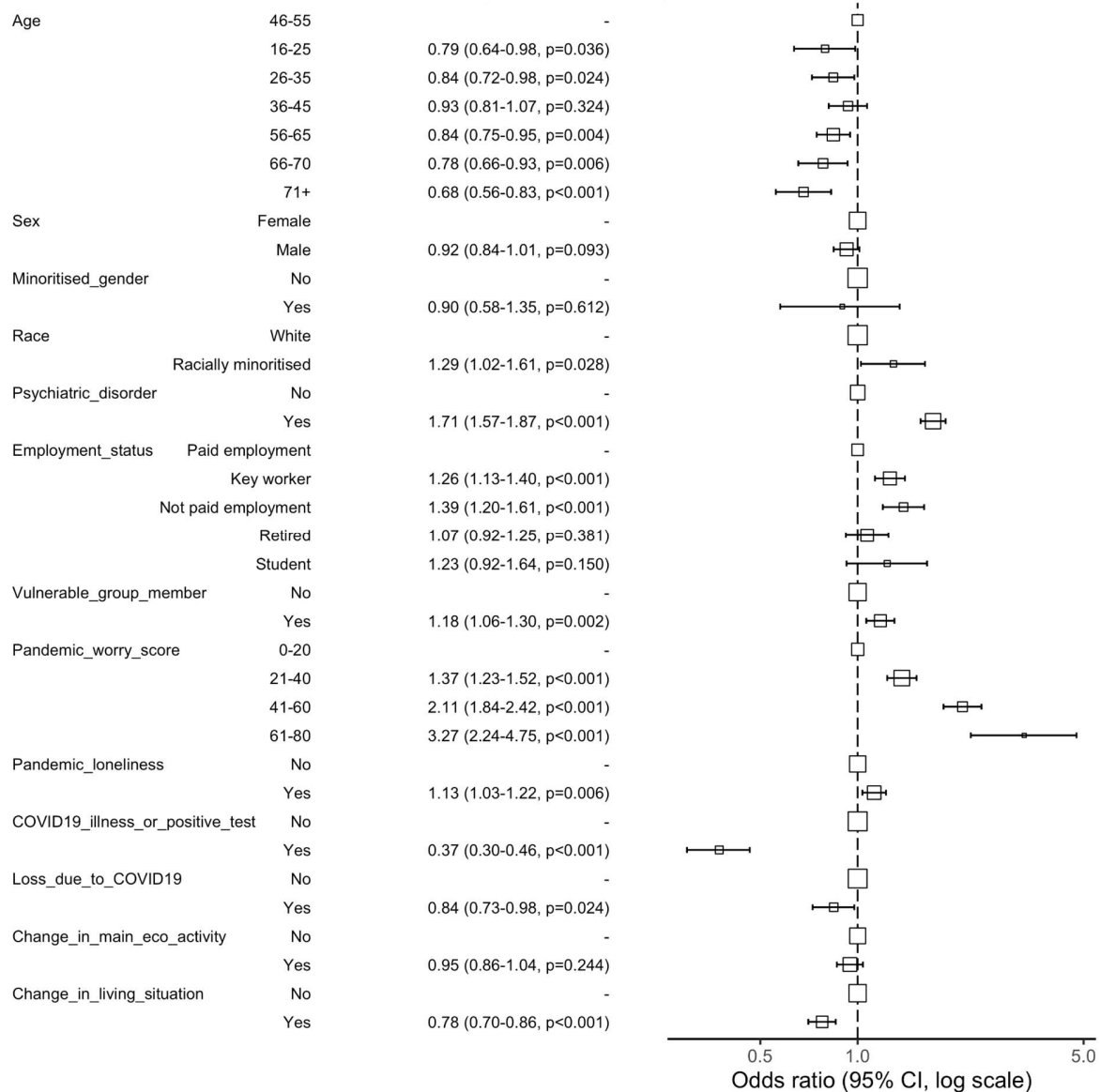


FIGURE 1 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic derived from multiple logistic regression models ($n = 18,172$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

New onset low weight during pandemic: OR (95% CI, p-value)

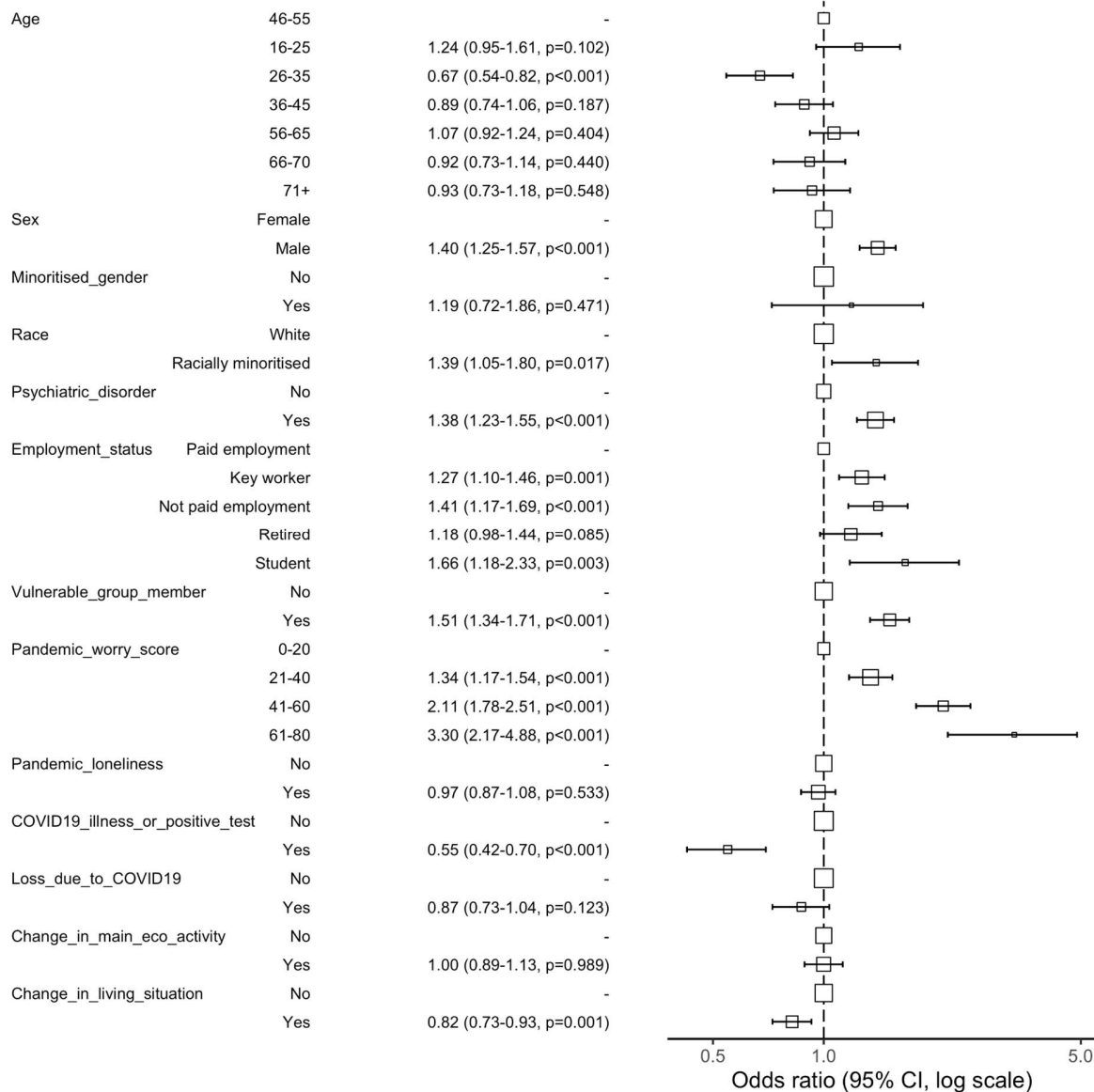


FIGURE 2 Association between demographic and COVID-related variables and new onset of low weight during the pandemic derived from multiple logistic regression models ($n = 19,148$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

New onset suicidal and/or self-harm ideation during pandemic: OR (95% CI, p-value)

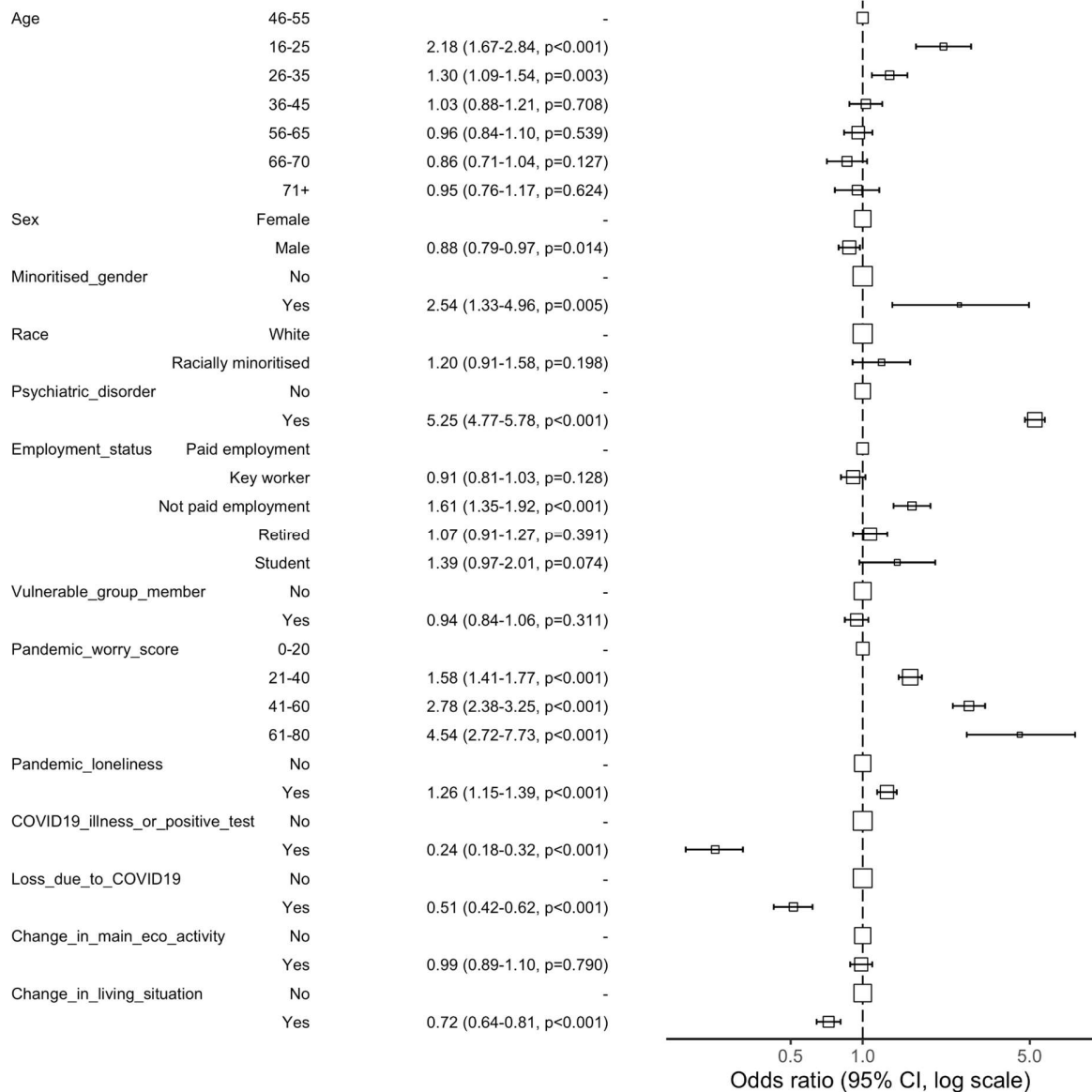


FIGURE 3 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic derived from multiple logistic regression models ($n = 12,650$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

New onset self-harm during pandemic: OR (95% CI, p-value)

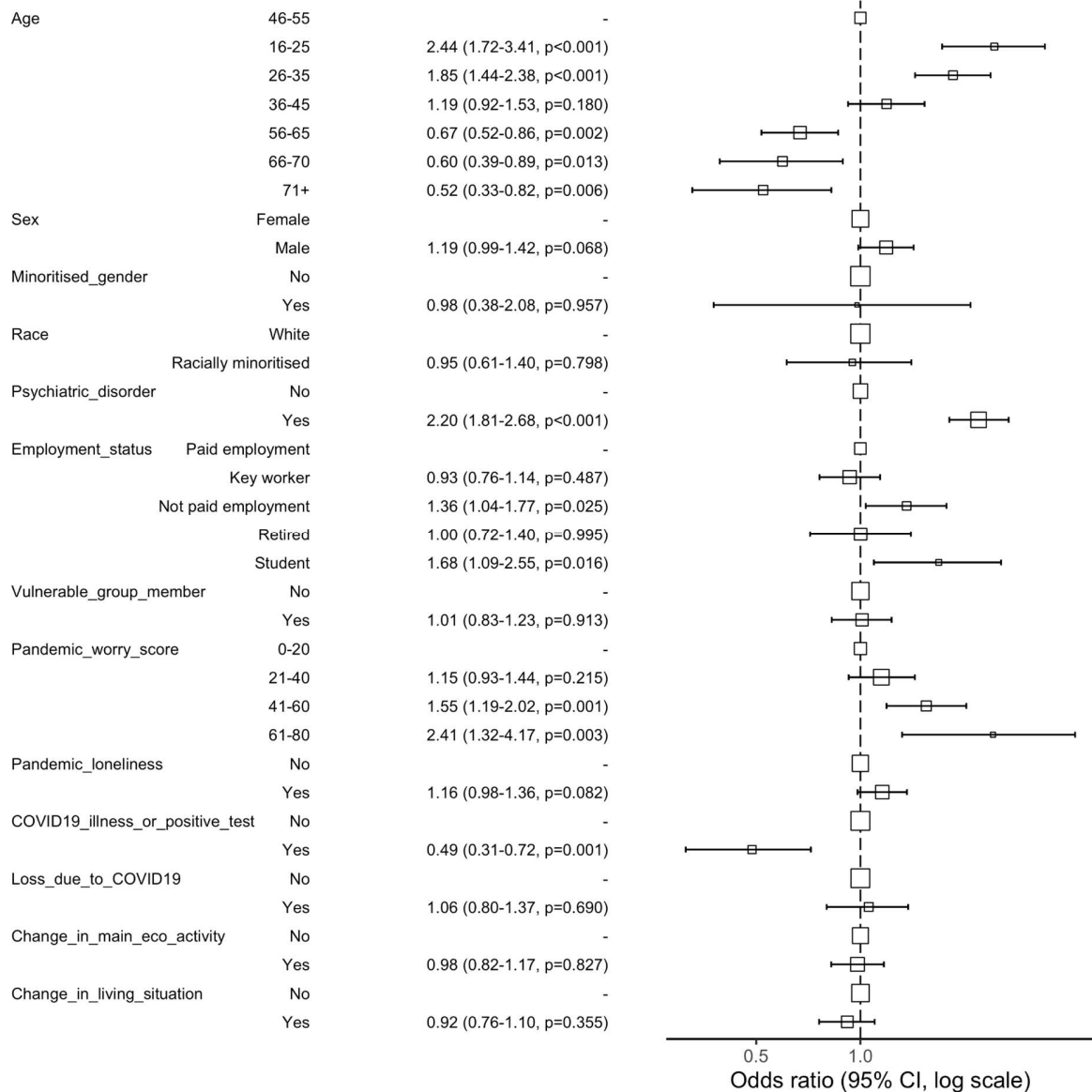


FIGURE 4 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic derived from multiple logistic regression models ($n = 20,266$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'. The exact definition of all other variables are in the Supplementary materials.

3.3 Sensitivity analysis results

Our sensitivity analyses indicated that our results from the main analysis were robust to ascertainment bias in terms of psychiatric disorders (Supplementary Figures 7-14) and inflammatory bowel disease (Supplementary Figures 15-22), missing data (Supplementary Figures 23-30), and our attempt to further limit the possibility of reverse causality

(Supplementary Figures 31-38). Additionally, our results were robust to controlling for education across all models (Supplementary Figures 39-46) and OCD symptoms in the low weight model (Supplementary Figures 47-48). Compared to having no formal qualifications, being of a higher education status (NVQ, A-levels, or university/professional qualification) was associated with lower odds of binge eating (OR=0.62, 95% CI 0.47,0.82, $p=0.001$; OR=0.67, 95% CI 0.52,0.86, $p=0.002$; OR=0.55, 95% CI 0.43,0.69, $p<0.001$). Similarly, being of a higher education status (GCSE, A-levels, or university/professional qualification) was associated with lower odds of low weight (OR=0.60, 95% CI 0.44,0.81, $p=0.001$; OR=0.65, 95% CI 0.48,0.87, $p=0.003$; OR=0.47, 95% CI 0.36,0.62, $p<0.001$). Recent OCD symptoms were linked to higher odds of low weight (OR=1.26, 95% CI 1.12,1.43, $p<0.001$). See Supplementary materials section 2.2 for further details.

4 Discussion

One of the strongest shared risk factors for new onset of all outcomes in our study - binge eating, low weight, suicidal and/or self-harm ideation, and self-harm - was a lifetime psychiatric disorder, consistent with previous research^{22,26,30-33}. Mental ill health has been reported to result in reduced resilience in the face of adversity⁴⁴, leaving a person vulnerable to experiencing further psychiatric symptoms⁴⁵. Additionally, participants in our study with a pre-existing psychiatric disorder may represent a subgroup of individuals more vulnerable to mental ill health because of, for example, their genetics or prior exposure to traumatic events. Therefore, these individuals may have been more likely to experience new psychiatric symptoms during extreme changes in their environment, such as during a pandemic. Another shared risk factor across all outcomes was pandemic-associated worry. This is consistent with our hypothesis that individuals with pandemic-related difficulties would be more at risk of psychiatric symptoms. Indeed, worries specific to the COVID-19 pandemic, such as anxiety about damages to the healthcare system or fear of infection, have previously been linked to maladaptive coping strategies⁴⁶. We also identified that, compared to participants in paid employment, those not in paid employment were at greater risk of experiencing low weight, binge eating, and suicidal and/or self-harm ideation. Financial worries and stress - that may arise due to a lack of paid employment - have been associated with mental ill health during the pandemic^{22,26,27,31,33,47}, and thus may explain our finding. Additionally, a sense of purpose has been reported to buffer against the impact of difficult experiences⁴⁸. Having a definite purpose through paid employment may be particularly pertinent given that, during the pandemic, activities outside of work were severely limited.

In addition to the shared risk factors outlined above, we also identified shared protective factors. For instance, contrary to our hypothesis, being infected with SARS-CoV-2 or illness with COVID-19 offered a protective effect against all outcomes. Most infections are mild⁴⁹ or asymptomatic⁵⁰, and following recovery from such illness, participants may have felt relieved that the illness was not as severe as anticipated and/or that they now believed themselves to have some level of increased immunity. The potential for a subsequent reduction in anxiety or stress may explain our unexpected finding. Moreover, participants who reported a change in their living situation had lower odds of new onset binge eating, low weight, and suicidal and/or self-harm ideation. This highlights that the ability to choose and adapt to changes in your environment may be important for your mental health, particularly at times of high stress. Indeed, living in a more crowded household or one without access to a garden has been linked to poorer mental health during the pandemic⁵¹. However, it is important to note that choosing one's living situation is limited to a privileged minority; for most people, this is limited by financial constraints, place of work, and familial responsibilities. Thus, this finding may also reflect economic advantages.

Some risk and protective factors were specific to self-harm symptoms. For example, consistent with our hypothesis and with previous research^{30,31,52-54}, being younger than mid-life was linked with higher odds of new onset suicidal and/or self-harm ideation and self-harm. The pandemic exacerbated some known triggers for self-harm symptoms amongst young people, including conflict at home⁵⁵, financial problems⁵⁵, and social isolation⁵⁶⁻⁵⁸. Similarly to the latter finding, the related, although distinct⁵⁹, construct of self-reported pandemic-related loneliness in our

study was linked to higher odds of suicidal and/or self-harm ideation. Contrary to our hypothesis, loss of a loved one or relative due to COVID-19 was associated with lower odds of new onset suicidal and/or self-harm ideation, despite the fact that people were often unable to visit their loved ones in hospital or attend funerals during the pandemic^{60,61}. Our finding may reflect a particular grief response in which, in anticipation of grief, people engage in proactive goal setting, live with greater intention, and re-prioritise⁶². Such behaviours may reduce the likelihood of experiencing new psychiatric symptoms. However, we would like to emphasise that our findings should not minimise the intensely difficult experience of losing a loved one during the pandemic, which some of the authors of this study directly experienced.

We also identified risk factors specific to eating disorder symptoms. For example, being a key worker was linked to higher odds of new onset low weight and binge eating. Previous research has suggested that key workers are vulnerable to mental ill health because of challenges such as increased workload, as well as fear of contracting COVID-19 and of infecting their loved ones⁶³. Indeed, both SARS-CoV-2 infection and subsequent COVID-19 rates were higher in key workers than non-key workers^{64,65}. Further, contrary to our hypothesis and the established literature from before the pandemic^{66,67}, being male was associated with higher odds of low weight. Our study highlights that the pandemic may have generated an environment in which males were particularly likely to develop low weight. This may be indicative of a trend of increasing rates of eating disorders in males over time⁶⁸ but requires further study given gendered expectations of weight^{69,70} and thus possible biases in the reporting of low weight between sexes.

Our findings should be interpreted in light of limitations. While sample size is a key strength of our study, some of the eating disorder and self-harm symptoms occurred rarely in individuals with certain exposures. For example, only 88 participants who reported a SARS-CoV-2 infection or illness with COVID-19 also reported a new experience of binge eating. Further, our sample consisted of mostly white, university-educated, female participants, recruited to various volunteer cohorts, which may limit the generalisability of our findings to the wider population. Third, some outcome measures were limited. The question about low weight was limited in its phrasing, and the question about binge eating did not include a direct assessment of loss of control, a key aspect of binge eating^{24,71}. Future research should investigate the full spectrum of eating disorder symptoms (for instance, purging behaviours) and focus on recruiting males, people of colour, and those of a lower education status.

Overall, we detected subgroups, such as those with a prior history of mental ill health or not in paid employment, that were more likely to develop new onset of eating disorder or self-harm symptoms during the pandemic. Close monitoring of people with these risk factors during future pandemics may enable early identification of new psychiatric symptoms.

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Data, materials, and code availability statement: The COPING study data are not publicly available however are available via a data request application to the NIHR BioResource (<https://bioresource.nihr.ac.uk/using-our-bioresource/academic-and-clinical-researchers/apply-for-bioresource-data/>). Deidentified RAMP Study data included in analyses presented here are available from study authors on request. All code for this study is publicly available: https://github.com/RAMP-COPING/EDBehaviour_SelfHarm.

Funding statement: This work was supported by the National Institute for Health and Care Research (NIHR) BioResource [RG94028, RG85445], NIHR Biomedical Research Centre [IS-BRC-1215-20018], HSC R&D Division, Public Health Agency [COM/5516/18], MRC Mental Health Data Pathfinder Award (MC_PC_17,217), and the National Centre for Mental Health funding through Health and Care Research Wales. The RAMP study is supported in part by the King's Together Multi and Interdisciplinary Research Scheme (Rapid COVID-19 call, Round 1; Round 2). Helena Davies and Alicia Peel acknowledge funding from the Economic and Social Research Council (ESRC) as part of a PhD studentship. Dr Hübel acknowledges funding from Lundbeckfonden

(R276-2018-4581). Dr Herle is funded by a fellowship from the Medical Research Council UK (MR/T027843/1). Jessica Mundy acknowledges funding from the Lord Leverhulme Charitable Grant. Kai Xiang Lim acknowledges funding from King's International Postgraduate Research Scholarship. The RAMP study is supported in part by the King's Together Multi and Interdisciplinary Research Scheme (Rapid COVID-19 call, Round 1; Round 2). Dr Young acknowledges funding from MQ; Transforming Mental Health (MQF20/24). Johan Zvrskovec and Abigail ter Kuile acknowledge funding from the National Institute for Health and Care Research (NIHR) Biomedical Research Centre and Guy's and St Thomas' NHS Foundation Trust.

Conflict of interest: Prof Breen has received honoraria, research or conference grants and consulting fees from Illumina, Otsuka, and COMPASS Pathfinder Ltd. Prof Hotopf is principal investigator of the RADAR-CNS consortium, an IMI public private partnership, and as such receives research funding from Janssen, UCB, Biogen, Lundbeck and MSD. Prof McIntosh has received research support from Eli Lilly, Janssen, and the Sackler Foundation, and has also received speaker fees from Illumina and Janssen.

Acknowledgements: We thank the GLAD, EDGI UK, RAMP and NIHR BioResource volunteers for their participation, and gratefully acknowledge the NIHR BioResource centres, NHS Trusts and staff for their contribution. We thank the National Institute for Health Research, NHS Blood and Transplant, and Health Data Research UK as part of the Digital Innovation Hub Programme. Patient and public involvement groups and services for the RAMP Study were provided by the NIHR KCL-Maudsley Biomedical Research Centre. This study presents independent research funded by the NIHR Biomedical Research Centre at South London and Maudsley NHS Foundation Trust and King's College London. Further information can be found at <http://brc.slam.nhs.uk/about/core-facilities/bioresource>. The views expressed are those of the authors and not necessarily those of the NHS, the NIHR, the HSC R&D Division, King's College London, or the Department of Health and Social Care.

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Supplementary materials

Risk and protective factors for new onset binge eating, low weight, and self-harm symptoms in >25,000 individuals in the UK during the COVID-19 pandemic

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1 SUPPLEMENTARY METHODS

1.1 Exposures in main analysis

We measured a range of demographic, clinical, and COVID-related exposure variables at baseline assessment. Below, we have described how we defined each of them for this study.

Age. Age was assessed in the COPING study and RAMP Study baseline surveys, in the 'demographics' questionnaire. In the RAMP Study, participants were asked their age category. Therefore, we collapsed age from all other cohorts into categories (i.e., 16-25, 26-35, 46-55, 56-65, 66-70, and 71+).

Sex. All NIHR BioResource participants were asked their assigned sex at birth in the COPING study baseline survey, in the 'demographics' questionnaire (i.e., 'Male' or 'Female'). RAMP Study participants were not explicitly asked their sex. Thus, for RAMP Study participants, we used their self-reported gender and whether they considered themselves transgender to decipher their probable assigned sex at birth.

Minoritised gender. Gender was self-reported in the COPING study and RAMP Study baseline surveys, again in the 'demographics' questionnaire, with options of 'Male', 'Female', 'Non-binary' and 'Prefer to self-define'. We categorised responses of 'Male' as 'being a man' and 'Female' as 'being a woman'. Responses of 'Non-binary' and 'Prefer to self-define' were categorised as 'minoritised gender'. In the GLAD Study and EDGI UK sign-up surveys and the RAMP Study baseline survey, participants were also asked whether they identify as transgender. Responses of transgender were additionally classified as 'minoritised gender'. Sample sizes in these more refined groups within the 'minoritised gender' category were too small to keep them as independent categories.

Racially minoritised. Race was self-reported in the GLAD Study and EDGI UK sign-up 'demographic' questionnaires. Answer options included: 'White', 'Mixed', 'Asian or Asian British', 'Black or Black British', 'Arab', and 'Other'. Other NIHR BioResource cohorts self-reported their race at initial enrolment to the BioResource (e.g., 'Asian or Asian British - Indian', 'Black or Black British - Caribbean'). RAMP Study participants were asked their race in the 'demographics' questionnaire in the RAMP Study baseline survey (e.g., 'White, white European or Caucasian', 'Black or Black British'). For participants who self-reported being white, we categorised them as 'not racially minoritised'. For all other participants, we categorised them as 'racially minoritised' (again, sample sizes in the more refined racial groups were too small to keep them as independent categories).

Psychiatric disorder. Participants who indicated having any psychiatric disorder diagnosis in their respective sign-up or baseline surveys were classified as having a psychiatric disorder. The answer options included: 'Major depressive disorder', 'Perinatal depression', 'Premenstrual dysphoric disorder', 'Bipolar disorder', 'Generalised anxiety disorder', 'Social anxiety disorder', 'Specific phobia, agoraphobia', 'Panic disorder', 'Post-traumatic stress disorder', 'Obsessive compulsive

disorder (OCD)', 'Body dysmorphic disorder', 'Other OCD', 'Anorexia nervosa', 'Atypical anorexia nervosa', 'Bulimia nervosa*', 'Binge-eating disorder*', 'Atypical bulimia nervosa*', 'Atypical binge-eating disorder*', 'Purging disorder', 'Night eating syndrome', 'Pica', 'Avoidant Restrictive Food Intake Disorder', 'Rumination disorder', 'Other feeding or eating disorder', 'Schizophrenia', 'Schizoaffective disorder', 'Psychosis', 'Personality disorder', 'Autism spectrum disorder', and 'Attention Deficit Hyperactivity Disorder'. Additionally, responses of 'Yes' to the question 'Have you ever received treatment for an eating disorder?' were considered as endorsement of having a diagnosed eating disorder. In addition to self-reported diagnoses, we identified eating disorder cases (anorexia nervosa*, bulimia nervosa*, and binge-eating disorder*) using DSM-5 algorithms made up of responses to the ED100K². Participants who answered 'None of the above' to all questions about diagnosed psychiatric disorders and who did not meet criteria for any of the algorithmically-derived eating disorders were classified as not having a psychiatric disorder at baseline.*

**Note: As we outline in our definition of our outcomes in section 1.2, a large number of participants with eating disorders that include the symptoms of binge eating and/or low weight were identified as having pre-pandemic experience of the outcome and thus were dropped from analysis.*

Paid employment and key worker status

Key worker. In the COPING study and RAMP Study baseline survey, participants were asked, '*Do you work in any of these professions identified as key workers by the government?*'. Participants who endorsed any of the listed professions ('*Health and social care*', '*Education and childcare*', '*Key public services [i.e. justice system, journalists, religious staff, responsible for dealing with the deceased]*', '*Key public services [i.e. refuse collection and maintenance, water, gas electricity, infrastructure]*', '*Local and national government*', '*Involved in production, processing, distribution or delivery of food or other necessary goods*', '*Public safety and national security [including military and police personnel]*', '*Transport*', '*Utilities, communication and financial services*', or '*Other*') were identified as key workers. Participants who answered '*None of these*' were identified as not being key workers.

Paid employment. In the COPING study and RAMP Study baseline surveys, participants were asked '*What was your employment status prior to the pandemic?*'. All participants who endorsed '*Retired*', '*Student (GCSE or A level)*', or '*Student (University)*', were grouped into '*Retired*' or '*Student*', respectively. These participants were not given any follow-up employment questions. Participants who endorsed any other answer options were subsequently asked, '*Has your employment status changed since the pandemic began?*'. To decipher employment status at baseline, we considered participants' answers to both questions. Any participant who indicated previously being in paid employment (i.e., '*Full-time employed*', '*Part-time employed*', '*Zero-hours contract*', '*Self-employed*', '*Contract or freelance work*' or '*Small business owner*') and who then endorsed one of the following options: '*My employment status has not changed*', '*Reduction in hours*', '*Reduction in salary*', '*Benefits increased*', '*Benefits decreased*', '*Change in duties or responsibilities*', '*Increased hours*', '*Increased salary*', '*Furloughed or paid leave (Government funded)*', '*Furloughed or paid leave (Company funded)*', '*Furloughed or paid leave (Government*

funded with company supplement) or *'Other'*, were classified as being in paid employment at baseline assessment. Additionally, any participant who endorsed the answer option of *'Became employed'* in the follow-up question were also classified as being in paid employment at baseline assessment.

Contrastingly, participants who indicated that previously they were not in paid employment, (i.e., *'Unemployed'*, *'Stay-at-home parent or carer'*, *'Receiving state income'*) and who subsequently endorsed any of the following options: *'My employment status has not changed'*, *'Benefits increased'*, *'Benefits decreased'*, *'Change in duties or responsibilities'*, or *'Other'*, were categorised as not being in paid employment at baseline. Additionally, all NIHR BioResource participants were given the answer option of *'Taking unpaid leave'*, which we categorised as not being in paid employment. Finally, all participants who answered *'Became unemployed'* to the follow-up question were identified as not being in paid employment. For participants who did not answer the follow-up question *'Has your employment status changed since the pandemic began?'*, we used their answers from the question *'What was your employment status prior to the pandemic?'* to decipher their employment status at baseline.

From the above, we grouped participants into the following categories: 1) in paid employment but not a key worker, 2) key worker (and therefore in paid employment), 3) not in paid employment, 4) student, and 5) retired.

Pandemic worry. In the COPING study and RAMP Study baseline survey, participants were asked their recent levels of worry about 21 different items, *'Over the past two weeks, how worried have you been about the following issues?'*. The listed issues included: *'Being socially isolated'*, *'People you know being socially isolated'*, *'Shortage of essential supplies'*, *'Shortage of medication or access to healthcare'*, *'Shortage of essential supplies or healthcare for people you know'*, *'Accuracy of information about the virus from the government and social media'*, *'The government's response to the pandemic'*, *'Separation from family members'*, *'A global recession or long-standing impact on the economy'*, *'Impact on your employment status'*, *'The employment status of other key earners in your household'*, *'Impact on your education or exams'*, *'Impact on the education or exams of your children'*, *'Financial impact'*, *'Contracting the virus'*, *'People you know contracting the virus'*, *'People you don't know contracting the virus'*, *'Impact on your own mental health and wellbeing'*, *'Impact on your children's mental health and wellbeing'*, *'Impact on the mental health of other relatives'*, and *'Other'*. We first calculated the missingness across each item. The item *'Other'* had higher missingness (36.2%) than all other listed items (11.3-11.6%). Therefore, we dropped this item from the overall sum score. Answer options and their assigned scores were: *'Not applicable'* (0), *'Not at all worried'* (0), *'Not too worried'* (1), *'Somewhat worried'* (2), *'Very worried'* (3), *'Extremely worried'* (4). We calculated sum scores with complete cases, in which the minimum score was 0 and the maximum was 80. We grouped participants into scores of 0-20, 21-40, 41-60, and 61-80.

Member of a vulnerable group. Participants who answered *'Yes'* to the question, *'Are you a member of a vulnerable group in need of additional isolation or protective measures during the pandemic as identified by the government?'* in the COPING study and RAMP Study baseline survey

were considered members of a vulnerable group. Those who answered 'No' were classified as not being part of a vulnerable group.

Pandemic loneliness. In the COPING study and RAMP Study baseline surveys, participants were asked: *'Over the past two weeks, how often have you felt that the following statements apply to you?'* The following statements were: *'Felt that you lack companionship'*, *'Felt left out'*, *'Felt isolated from others'*, and *'Felt alone'*. The answer options for each statement were: *'Hardly ever'*, *'Some of the time'*, and *'Often'*.

Participants were then asked *'How similar is this to how often you felt this way before the pandemic?'* with the answer options of *'I felt this way much more frequently'*, *'I felt this way a little more frequently'*, *'No different'*, *'I felt this way a little less frequently'*, and *'I felt this way much less frequently'*. Those who indicated a change (i.e., answered anything other than *'No different'*) were then asked *'Before the pandemic, how often have you felt that the following statements apply to you?'* with the same statements. Again, the answer options were: *'Hardly ever'*, *'Some of the time'*, and *'Often'*.

We calculated a 'retrospective pre-pandemic loneliness score' and 'pandemic loneliness score', in which, to each relevant question, answers of *'Hardly ever'* were scored as 0, *'Some of the time'* were 1, and *'Often'* were 2. The minimum possible score for each was 0 and the maximum was 8. People whose 'pandemic loneliness scores' were higher than their 'retrospective pre-pandemic loneliness scores' were categorised as experiencing higher loneliness during pandemic, i.e., pandemic loneliness. People whose 'pandemic loneliness scores' were the same as or lower than their 'retrospective pre-pandemic scores' were categorised as having not experienced greater loneliness during the pandemic. Participants who did not get asked about the follow-up question concerning pre-pandemic loneliness because they indicated that it was *'No different'* to their loneliness during the pandemic were also categorised as having not experienced greater loneliness during the pandemic.

Exposure before outcome

For all of the below exposures, we utilised data from each follow-up phase as well as data from the baseline survey (if available). If a participant self-reported experiencing both the exposure and the outcome, their data were only included in the relevant regression model if their first self-report of the exposure occurred in the same phase or before the phase in which they first self-reported the outcome. For participants who answered twice within a single phase (i.e., answered one survey late and the next on time), we counted an answer of 'Yes' to the outcome or exposure in either response during the phase as an endorsement during that phase. For the remaining participants, we counted an answer of 'No' to the outcome or exposure in either phase as the participants not having experienced the relevant outcome or exposure during that phase.

COVID-19 infection. We assessed whether a participant had been infected with COVID-19 via questions included in three questionnaires. First, in every other COPING study and RAMP Study follow-up survey, participants were given a 'virus' questionnaire, which asked: *'Have you ever*

had a COVID-19 test? Please include any tests you've reported in past surveys' and 'Have any of your tests come back positive for COVID-19 or antibodies?'. Second, a 'respiratory' questionnaire, which was included at baseline and at every follow up phase, asked: 'Did you have a nose/throat swab to test for Coronavirus in the last week?' and 'What were the results of the nose/throat swab test?' and 'Did you have an antibody test for Coronavirus in the last week?' and 'What were the results of the antibody test?'. Third, in the 'demographics' questionnaire included in every follow-up phase, participants were asked, 'In the last two weeks, has your physical health changed because you became unwell with the coronavirus?'.

Participants were categorised as having been infected with COVID-19 if, at any point, they answered 'Positive' to any of the three questions in the 'virus' and 'respiratory' questionnaires about the test results or answered 'Yes' to the question about being unwell with the coronavirus in the 'demographics' questionnaire. Participants who never answered any of the aforementioned questions at any phase or who indicated that they had taken a test but did not indicate the test results were dropped from our analyses. Out of the remaining participants, those who indicated at least once during the monitoring period that they had not taken a test, that their results were negative, and/or that their physical health had not changed because of COVID-19 illness were classified as having not been ill with COVID-19.

Loss of loved one or relative due to COVID-19. Two questionnaires included in the COPING study and RAMP Study surveys enabled assessment of this variable. First, the 'grief' questionnaire, which was given to participants at baseline and at every follow-up survey, asked participants: *'In the past month, have you lost someone close to you due to COVID-19?'*. Second, the question *'Has a relative that was previously ill with coronavirus or suspected coronavirus passed away?'* was included in the 'demographics' questionnaire and was given to participants at every follow-up.

Participants who at any point answered 'Yes' to either question were categorised as having lost someone due to COVID-19. Participants who never answered or who only ever answered 'Prefer not to say' were dropped from our analyses. Of the remaining participants, those who answered 'No' at least once to either question were categorised as not having lost someone due to COVID.

Change in main economic activity: Employment. In the COPING study and RAMP Study baseline 'employment' questionnaire, participants were asked: *'Has your employment status changed since the pandemic began?'* and given the answer options of: *'My employment status has not changed', 'Became unemployed', 'Reduction in hours', 'Reduction in salary', 'Benefits increased', 'Benefits decreased', 'Change in duties or responsibilities', 'Became employed', 'Increased hours', 'Increased salary', 'Furloughed or paid leave (Government funded)', 'Furloughed or paid leave (Company funded)', 'Furloughed or paid leave (Government funded with company supplement)', 'Taking unpaid leave', or 'Other'*. Then, at every follow-up phase, participants were asked: *'Has anything changed in the following domains in the last two weeks?'* with the following answer options: *'Nothing has changed', 'Living situation', 'Employment', 'Physical health', 'Health of a relative', 'Employment status of a key earner in your household', and 'Children/dependants returning to school or other education'*.

To the first question, participants who indicated anything other than *'My employment status has not changed'* at baseline were identified as having experienced a change in their main economic activity at baseline. People who answered *'My employment status has not changed'* were identified as having not experienced a change in their main economic activity at baseline. Similarly, participants who, at any phase, endorsed *'Employment'* or *'Employment status of a key earner in your household'* were categorised as having experienced a change in their main economic activity during the pandemic. People who indicated that they have not experienced a change in their main economic activity (i.e., by answering the question but not endorsing *'Employment'* or *'Employment status of a key earner in your household'*) at least once were categorised as having not experienced a change in their main economic activity.

Change in main economic activity: Education. Participants who had previously indicated they were a student were asked regarding the COVID-19 pandemic, *'How has this impacted your studies?'* in the COPING study and RAMP Study baseline employment questionnaire. Answer options included *'No impact'*, *'Cancelled exams'*, *'Change in format of exams'*, *'Automatic pass'*, *'Change in deadlines'*, *'Change in lesson delivery'*, *'Grade decided based on past performance (e.g. coursework, predicted grades)'*, *'Cancelled classes'*, *'Cannot complete degree'*, *'Impact on studies still unknown'*, or *'Other'*. Participants who answered anything other than *'No impact'* and *'Impact on studies still unknown'* were counted as having experienced a change in their main economic activity. Participants who indicated *'No impact'* or *'Impact on studies still unknown'* were categorised as having not experienced a change in their main economic activity. This question was only included at baseline.

Change in living situation. In the COPING study and RAMP Study baseline 'demographics' questionnaire, participants were asked: *'What is your living status right now, during the pandemic?'*, followed by: *'Is this a change from your living situation before the pandemic?'*. Participants who answered *'Yes'* to the latter question were identified as having experienced a change of living situation at baseline. Responses to the aforementioned question, *'Has anything changed in the following domains in the last two weeks?'*, were used to establish whether participants had experienced a change in living situation in any of the follow-up phases (one answer option was *'Living situation'*). Participants who, at any phase, endorsed *'Living situation'* were categorised as having experienced a change in their living situation during the pandemic. People who indicated that they had not experienced a change in their living situation (i.e., by answering the question but not selecting *'Living situation'*) at least once were categorised as not having experienced a change in their living situation.

1.2 Outcomes

At frequent intervals, participants reported their experience of binge eating, low weight, passive suicidal ideation, self-harm ideation, and self-harm. Pre-pandemic experiences of each outcome - which in turn informed whether an experience during the pandemic was 'new' - were derived differently within and across each dataset due to variations in the available data. As outlined below, we wanted to first identify people without pre-pandemic experience of the outcomes.

These participants form the basis of our analysis. We then identify who went on to newly experience each outcome during the pandemic.

1.2.1 No pre-pandemic experience of low weight

EDGI UK. EDGI UK survey participants were not asked questions about eating disorder symptoms in the COPING study survey (EDGI UK launched in February 2020 so we had already collected recent symptom information). Therefore, only answers to the EDGI UK sign-up survey were available to identify whether an EDGI UK survey participant had pre-pandemic experience of low weight. Participants who did not endorse a lifetime diagnosis of anorexia nervosa in the MHD questionnaire¹ and did not report a lifetime experience of low weight in the ED100K² screener were classified as not having pre-pandemic experience of low weight. We took answers to the low weight question in the ED100K² for participants with missing diagnosis data, as it is the symptom of low weight that was our primary focus.

EDGI UK survey participants were asked about the age at which they experienced low weight. Therefore, for the participants who answered the EDGI UK sign-up survey during the pandemic and endorsed a lifetime experience of low weight, we were able to identify whether this was likely to be a newly-occurring pandemic experience or a pre-pandemic experience. We contrasted their age at symptom start with their age at the beginning of the pandemic. We dropped participants from our analysis who indicated that they were older at the start of the pandemic than they were when they experienced low weight or the same age (we cannot be certain when their symptoms started). Those who indicated that they were younger at the start of the pandemic than they were when they experienced low weight were classified as having a newly-occurring pandemic experience of low weight, and thus no pre-pandemic experience.

GLAD Study. GLAD survey participants in this study have answered both the GLAD Study survey (which includes the optional ED100K²) and the COPING study survey (which includes the mandatory ED100K²). We have utilised responses to both surveys to capture those with no pre-pandemic experience of our eating disorder outcomes (low weight and binge eating).

GLAD survey participants were asked questions about anorexia nervosa in the GLAD Study sign-up survey via the optional ED100K² and the MHD questionnaire¹. To identify those without pre-pandemic experience of low weight, we looked at only those who had completed the optional ED100K² or the MHD¹ within the GLAD Study survey after the 23rd January 2020. We chose the 23rd January 2020 as it is three months before the start of the pandemic; we have assumed that if participants do not report low weight after this date, any experience reported during the pandemic is likely to be for the first time. GLAD survey participants who, after this date, indicated that they did not have a lifetime experience of low weight (*'Have you ever had a period of time when you weighed much less than other people thought you ought to weigh?'*) or a lifetime diagnosis of anorexia nervosa were classified as not having pre-pandemic experience of low weight.

GLAD survey participants were asked for their age at symptom start, i.e., the age at which they first experienced low weight. Therefore, similarly to EDGI UK survey participants, GLAD survey participants whose age at low weight was younger than or the same as their age at the start of the pandemic were dropped from further analyses, as they were categorised as having pre-pandemic experience of low weight. Participants whose age at symptom start was older than their age at the start of the pandemic were categorised as having a newly-occurring pandemic experience of low weight and therefore also categorised as having no pre-pandemic experience of low weight.

GLAD survey participants also filled out the COPING study baseline survey which contained questions about eating disorders, including age at symptom start. The COPING study survey was launched during the pandemic (April 2020). Therefore, those who reported no lifetime diagnosis of anorexia and no lifetime experience of low weight were categorised as having no pre-pandemic experience of low weight. Participants who endorsed the ED100K² anorexia screener question in the COPING baseline survey, *'Have you ever had a period of time when you weighed much less than other people thought you ought to weigh?'* and who, to the question, *'How old were you then?'* indicated an age younger than or the same as their age at the start of the pandemic, were classified as likely to have pre-pandemic experience of low weight and were dropped from our analyses. Again, those with an age at symptom start older than their pandemic start age were classified as having a newly-occurring pandemic experience of low weight, and therefore no pre-pandemic experience.

GLAD survey participants who, in either the GLAD Study sign-up survey or the COPING study survey indicated pre-pandemic experience of low weight were dropped from our analyses. Those with no pre-pandemic experience of low weight were those who, of the remaining participants, were identified as having no pre-pandemic experience in either the GLAD Study survey and/or in the COPING study survey as outlined above. For participants with missing diagnosis data in both surveys, we took answers to the low weight question/s in the ED100K².

Remaining NIHR BioResource cohorts (IBD; COMPARE; STRIDES; INTERVAL; RTB-GEN). The remaining NIHR participants were asked questions about low weight in the COPING study baseline survey, including age at symptom start. We identified participants without pre-pandemic experience of low weight in the same way as the GLAD survey participants who completed the COPING study survey, as outlined above.

RAMP Study. RAMP Study participants were only asked about diagnoses in the MHD questionnaire¹ in the RAMP Study baseline survey. The participants were not given the ED100K² so symptom data at baseline were not available. Thus, any RAMP Study participant who indicated that they had not received a lifetime diagnosis of anorexia nervosa were classified as not having pre-pandemic experience of low weight. Those who endorsed a lifetime diagnosis were dropped from our analyses.

1.2.2 New onset low weight during the pandemic

In the RAMP Study baseline survey and in every other RAMP Study and COPING study follow-up survey, participants were asked, *'Over the past month, have you weighed much less than other people thought you ought to weigh?'* Participants with no pre-pandemic experience of low weight (established as outlined above) and who, at any point during the monitoring period, endorsed an experience of low weight, were classified as having a new onset of low weight during the pandemic. Of the remaining participants without pre-pandemic experience of low weight, those who answered *'No'* at least once were classified as not experiencing new onset of low weight.

1.2.3 No pre-pandemic experience of binge eating

EDGI UK. An EDGI UK survey participant was categorised as not having a pre-pandemic experience of binge eating if, in the EDGI UK sign-up survey, they did not self-report a lifetime diagnosis of bulimia, binge-eating disorder, atypical binge-eating disorder, or atypical bulimia in the MHD¹ and answered *'No'* to the question *'Have you ever had regular episodes of overeating or eating binges when you ate what most people would regard as an unusually large amount of food in a short period of time?'* in the ED100K². Participants who answered the EDGI UK survey during the pandemic (i.e., on or after the 23rd March 2020) and endorsed a lifetime diagnosis of a binge-type eating disorder (as listed above) were categorised as having pre-pandemic experience of binge eating, given that diagnostic delays means it is likely symptoms started before the pandemic. For those who, during the pandemic, reported a lifetime experience of binge eating, we contrasted their age at symptom start with their age at the beginning of the pandemic. We then applied the same rules to binge eating and age at symptom start as we did to low weight (outlined above) to identify EDGI UK survey participants with no pre-pandemic experience of binge eating. For participants with missing diagnosis data, we took answers to the binge eating question in the ED100K².

GLAD Study. To be categorised as not having pre-pandemic experience of binge eating, GLAD survey participants must have, in the GLAD Study sign-up survey after the 23rd January 2020, answered *'No'* to the question *'Have you ever had regular episodes of overeating or eating binges when you ate what most people would regard as an unusually large amount of food in a short period of time?'* in the optional ED100K², and have not self-reported a diagnosis of a binge-type eating disorder in the MHD questionnaire¹ or in the optional ED100K². For those who answered the GLAD Study or COPING study survey during the pandemic and self-reported lifetime binge eating, we cross-checked their age at symptom start with their age at the start of the pandemic. We applied the same rules to binge eating as we did to low weight (outlined above) to identify GLAD survey participants with no pre-pandemic experience of binge eating.

Remaining NIHR BioResource cohorts (IBD; COMPARE; STRIDES; INTERVAL; RTB-GEN). The remaining NIHR BioResource participants were asked questions about binge eating in the COPING study baseline survey in the same way as the GLAD survey participants in the COPING survey. Therefore, we identified participants without pre-pandemic experience of binge eating in the same way as in the GLAD Study, as outlined above.

RAMP Study. At baseline, RAMP Study participants were given a screener to the EDE-Q³, '*Over the past month, have you had regular episodes of overeating or eating binges when you ate what most people would regard as an unusually large amount of food in a short period of time?*'. Because the RAMP Study started during the pandemic (April 2020), the 'past month' in reference is during the pandemic. Therefore, an answer of 'Yes' only indicated whether a participant had a pandemic experience of binge eating. However, those who answered 'Yes' were subsequently directed to the EDE-Q, which included the question: '*Over the past 28 days BEFORE PANDEMIC, how many times have you: Eaten what other people would regard as an unusually large amount of food with a sense of having lost control over your eating?*'. Therefore, any RAMP Study participant who either did not get asked this question about binge eating before the pandemic (i.e., did not pass the EDE-Q screener question) or who gave an answer of zero, and who also self-reported that they did not have a lifetime diagnosis of '*Psychological overeating or binge-eating disorder*' or '*Bulimia nervosa*' were classified as not having pre-pandemic experience of binge eating.

1.2.4 New onset binge eating during the pandemic

All cohorts. In the RAMP Study baseline survey and in every other RAMP Study and COPING study follow-up survey, participants were asked, '*Over the past month, have you had regular episodes of overeating or eating binges when you ate what most people would regard as an unusually large amount of food in a short period of time?*'. Participants who had been identified as having no pre-pandemic experience of binge eating (established as outlined above) and who, at any point during the monitoring period, endorsed an experience of binge eating, were classified as having new onset binge eating. Of the remaining participants without pre-pandemic experience of binge eating, those who answered 'No' at least once were classified as not newly experiencing binge eating during the pandemic.

1.2.5 No pre-pandemic experience of passive suicidal ideation

All cohorts. In the COPING study and RAMP Study baseline surveys, participants were asked: '*Many people have thoughts that life is not worth living. Have you felt that way?*'. Participants who answered 'No' were classified as having no pre-pandemic experience of passive suicidal ideation. Participants who answered 'Yes, once' or 'Yes, more than once' were then asked '*Had you felt that way before the pandemic?*'. Of these participants, those who answered 'No' to this question were classified as having new onset of passive suicidal ideation during the pandemic and thus also no pre-pandemic experience.

1.2.6 New onset passive suicidal ideation during the pandemic

All cohorts. At every follow-up phase, participants were asked the following questions: '*Many people have thoughts that life is not worth living. Have you felt that way?*' and '*Have you felt that way in the past two weeks?*'. Those with no pre-pandemic experience and who, at any point during the monitoring period (including at baseline) endorsed either of these questions, were classified as having new onset passive suicidal ideation. Of the remaining participants without

pre-pandemic experience of passive suicidal ideation, those who answered 'No' at least once were classified as not having newly experienced passive suicidal ideation during the pandemic.

1.2.7 No pre-pandemic experience of self-harm ideation

All cohorts. In the COPING study and RAMP Study baseline surveys, participants were asked: *'Have you contemplated harming yourself?'*. Participants who answered 'No' were classified as having no pre-pandemic experience of self-harm ideation. Participants who answered 'Yes, once' or 'Yes, more than once' were then asked *'Had you felt that way before the pandemic?'*. Of these participants, those who answered 'No' to this question were classified as having new onset passive suicidal ideation during the pandemic and thus also no pre-pandemic experience.

1.2.8 New onset self-harm ideation during the pandemic

All cohorts. At every follow-up phase, participants were asked the following questions: *'Have you contemplated harming yourself?'* and *'Have you felt that way in the past two weeks?'*. Those with no pre-pandemic experience and who, at any point during the monitoring period (including at baseline) endorsed either of these questions, were classified as having new onset self-harm ideation. Of the remaining participants without pre-pandemic experience of self-harm ideation, those who answered 'No' at least once were classified as not having newly experienced self-harm ideation during the pandemic.

1.2.9 No pre-pandemic experience of self-harm

All cohorts. In the COPING study and RAMP Study baseline surveys, participants were asked: *'Before the pandemic, had you deliberately harmed yourself, whether or not you meant to end your life?'*. Participants who answered 'No' were categorised as not having pre-pandemic experience of self-harm.

1.2.10 New onset self-harm during the pandemic

At baseline and in every follow-up phase, participants were also asked, *'In the last two weeks, have you deliberately harmed yourself, whether or not you meant to end your life?'*. Those with no pre-pandemic experience and who, at any point during the monitoring period (including at baseline) endorsed self-harm, were categorised as having new onset self-harm. Of the remaining participants without pre-pandemic experience of self-harm, those who answered 'No' at least once were classified as not having newly experienced self-harm during the pandemic.

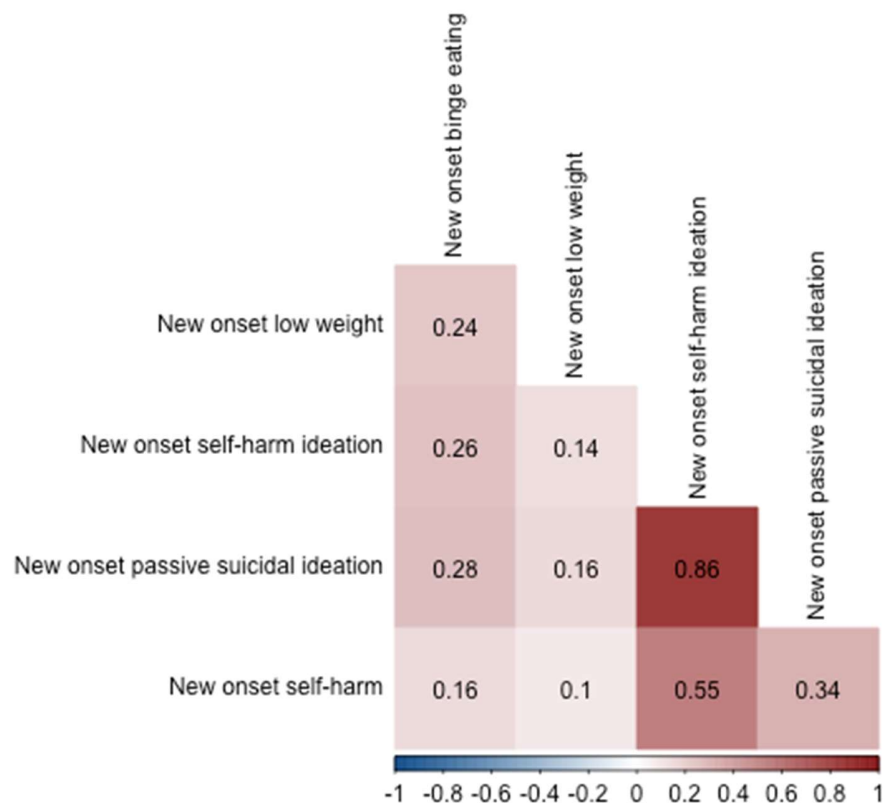
1.3 Exposures in sensitivity analyses

Highest education. Whilst data on GLAD Study and EDGI UK survey participants' highest education level were available from their respective sign-up surveys, we instead used responses from the COPING baseline survey for all NIHR BioResource participants to ensure data were the most up-to-date. In the COPING study baseline survey, participants were asked *'Which of these qualifications do you have?'* with response options of 'PhD', 'Master's degree or equivalent',

'Postgraduate degree or equivalent', 'Bachelor's degree or equivalent', 'A levels/AS levels or equivalent', 'O levels/GCSEs or equivalent', 'CSEs or equivalent', 'NVQ or HND or HNC or equivalent', 'Other professional qualifications (e.g. nursing, teaching)', and 'None of the above'. Answers were hierarchically categorised. People who endorsed *'PhD', 'Master's degree or equivalent', 'Postgraduate degree or equivalent', 'Bachelor's degree or equivalent'* and/or *'Other professional qualifications (e.g. nursing, teaching)'* were categorised first into *'University/Other professional qualifications'*. Next, people who endorsed *'A levels/AS levels or equivalent'* were categorised as *'A-levels'*, followed by people who endorsed *'NVQ or HND or HNC or equivalent'* who were categorised as *'NVQ'*. For the remaining participants, those who endorsed *'O levels/GCSEs or equivalent'* and/or *'CSEs or equivalent'* were categorised into *'GCSE/CSE'*. All remaining participants (i.e., who answered *'None of the above'*) were categorised as having *'no formal qualifications'*.

In the RAMP Study survey, participants were asked: *'What is your highest level of education?'* with response options of *'GCSE or equivalent'* (categorised as *'GCSE/CSE'*), *'A-levels or equivalent'* (categorised as *'A-levels'*), *'Bachelor's degree or equivalent'* (categorised as *'University/Other professional qualifications'*), *'Master's degree or equivalent'* (categorised as *'University/Other professional qualifications'*), *'Postgraduate degree or equivalent'* (categorised as *'University/Other professional qualifications'*), *'PhD'* (categorised as *'University/Other professional qualifications'*) and *'None of these'* (categorised as *'No formal qualifications'*).

OCD symptoms. In the COPING study and RAMP Study baseline surveys, all participants were given two screener questions to the Obsessive Compulsive Inventory - Revised (OCI-R⁴): *'Over the past two weeks, how often have you been bothered by unpleasant thoughts, urges, or images that repeatedly enter your mind? (e.g., thoughts about dirt or germs, thoughts about harm coming to yourself or others, strong urges for things to be ordered or symmetrical)'* and *'Over the past two weeks, how often have you been bothered by feeling driven to perform certain behaviours or mental acts over and over again?'*. Response options for both questions were on a 5-point scale from *'Not at all'* to *'Nearly every day'*. For each question, answers of anything other than *'Not at all'* were classified as endorsement of the relevant OCD-related thoughts/behaviours, whilst answers of *'Not at all'* were classified as no recent experience of OCD-related thoughts/behaviours. Preprocessing checks indicated that these two questions were highly correlated (Supplementary Figure 3; $r = 0.76$). Thus we combined these two items into one variable, *'OCD symptoms'*.



SUPPLEMENTARY FIGURE 1 Correlation matrix for all outcomes: binge eating, low weight, self-harm ideation, passive suicidal ideation, and self-harm, in the analysis sample ($n = 25,412$). All correlations are tetrachoric correlations.

SUPPLEMENTARY TABLE 1a Number of participants from the overall sample ($n = 45,058$) missing for each exposure reported at baseline only.

	N excluded
Age	5
Sex	155
Minoritised gender	103
Racially minoritised	912
Psychiatric disorder	1274
Employment status	562
Member of a vulnerable group	906
Pandemic worry score	5,353
Pandemic loneliness	5,338

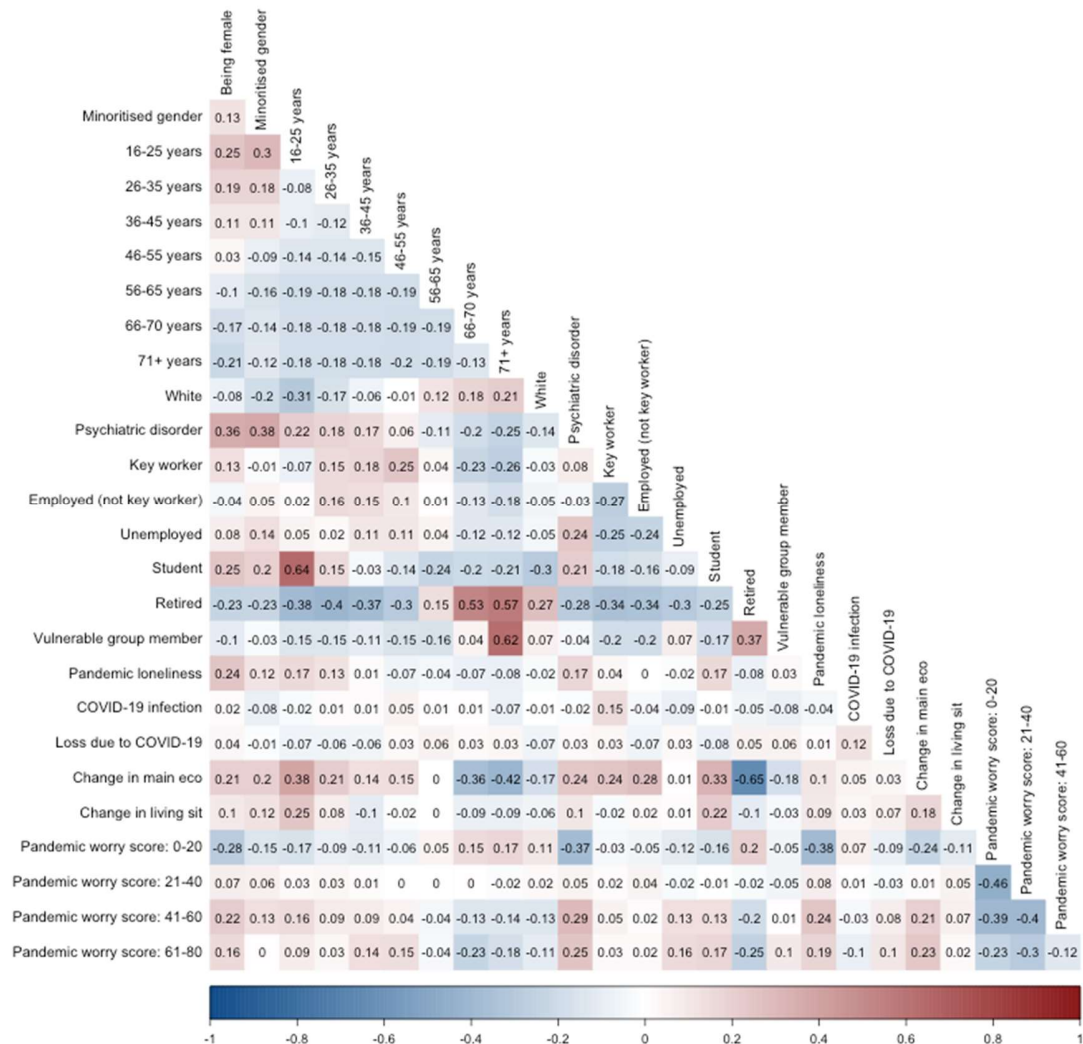
Note. Sex = assigned sex at birth; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

SUPPLEMENTARY TABLE 1b Number of participants from each sub-sample with complete data on each outcome (binge eating $n = 24,229$; low weight = 25,176; suicidal and/or self-harm ideation = 20,505; self-harm = 29,944) with missing data on each exposure measured at frequent intervals.

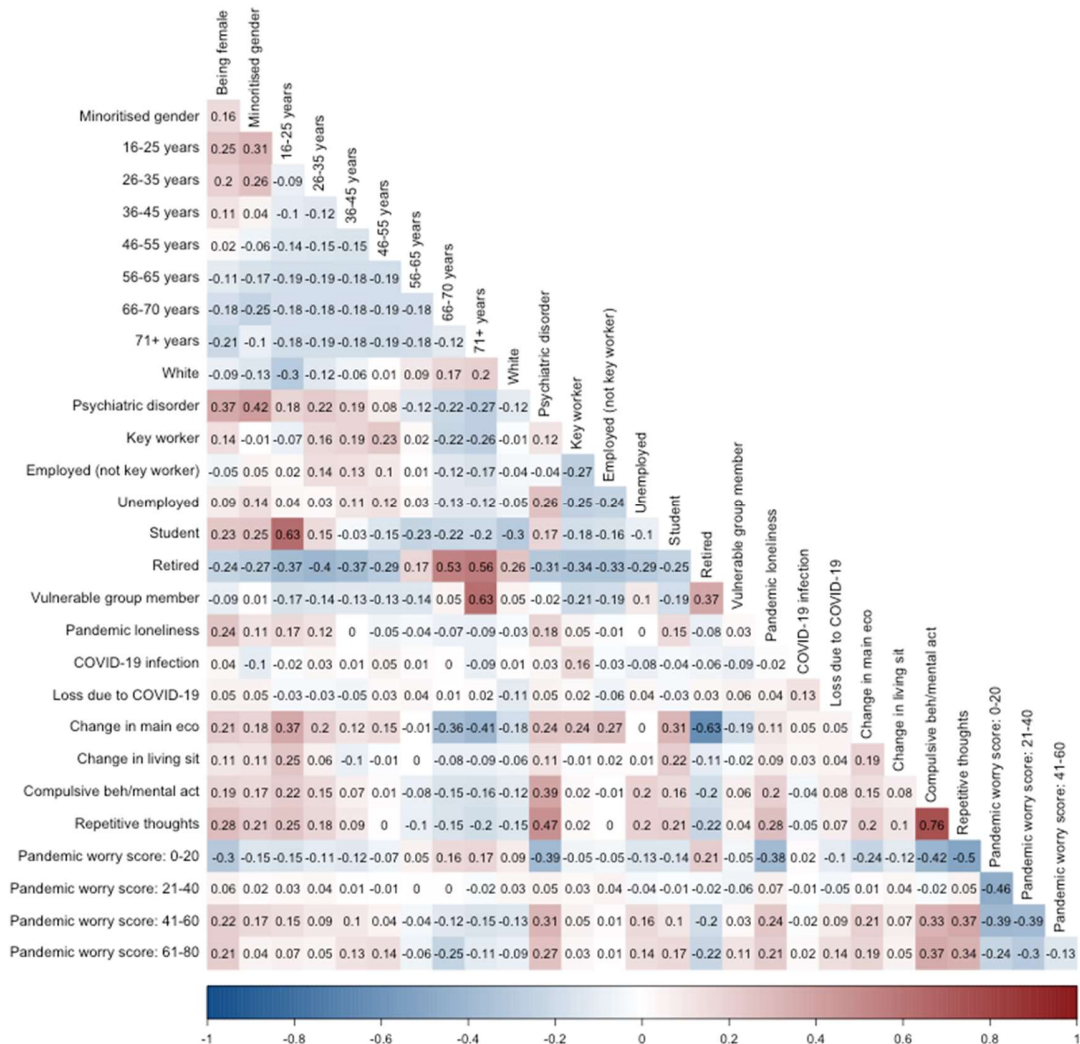
	N excluded			
	Binge eating	Low weight	Suicidal and/or self-harm ideation	Self-harm
COVID-19 illness or positive test	4,167	4,490	5,672	8,219

Loss of loved one or relative due to COVID-19	323	225	1,284	1,720
Change in main economic activity	490	338	1,244	1,009
Change in living situation	452	248	780	89

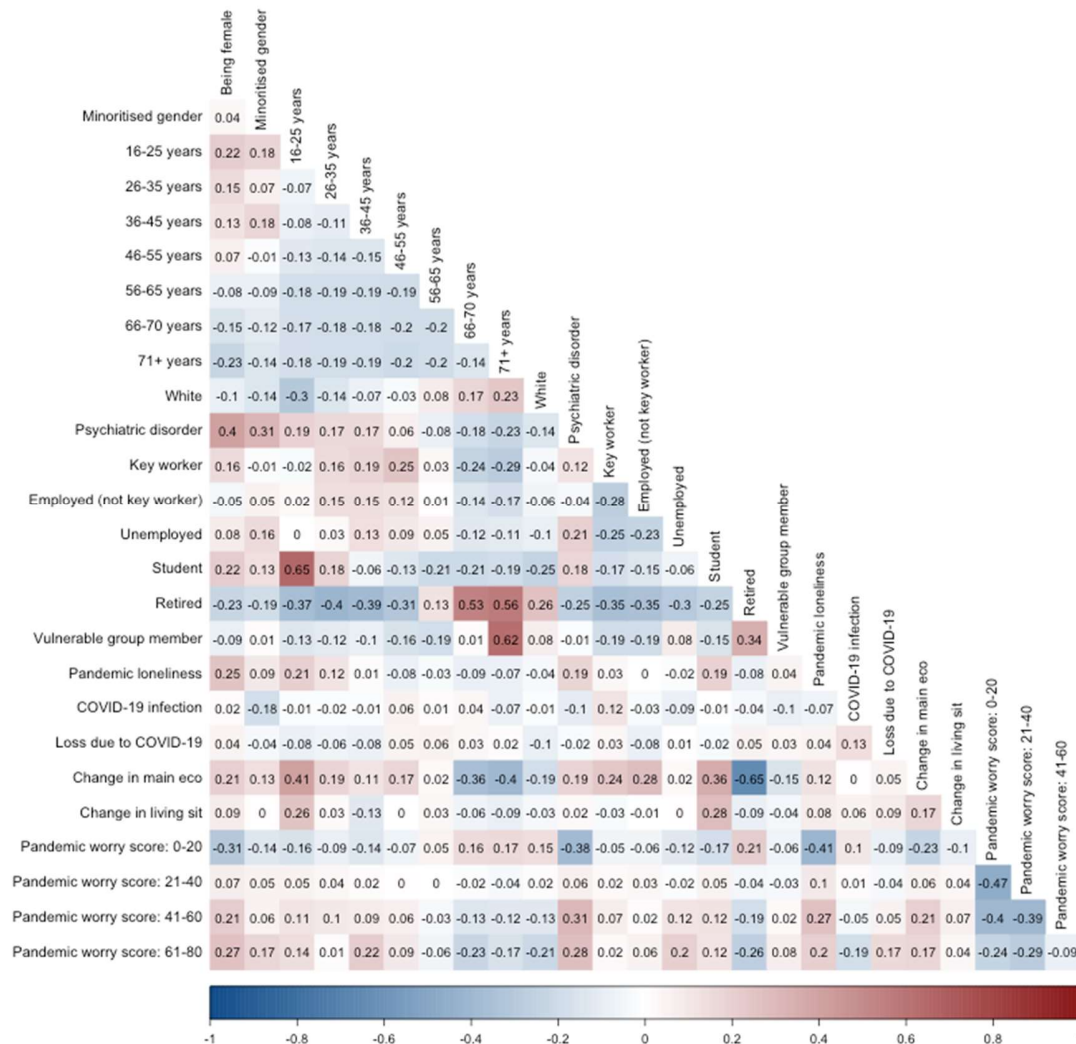
Note. The exposures 'COVID-19 illness or positive test', 'Loss of loved one or relative due to COVID-19', 'Change in main economic activity' and 'Change in living situation' were specific to the timing of each outcome; for participants who reported both the outcome and the exposure, we only included instances in which the exposure was first reported in the same phase as or a phase before the outcome was first reported; missing data includes both incomplete data and data in which the exposure was first reported after the first report of the outcome. The higher missingness for the self-harm-related outcomes is because questions about these outcomes were included in every follow-up phase, whilst questions about eating disorder symptoms were included in every other follow-up phase.



SUPPLEMENTARY FIGURE 2 Correlation matrix for all exposures included in the regression model with the outcome binge eating ($n = 18,172$). All correlations are tetrachoric correlations. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



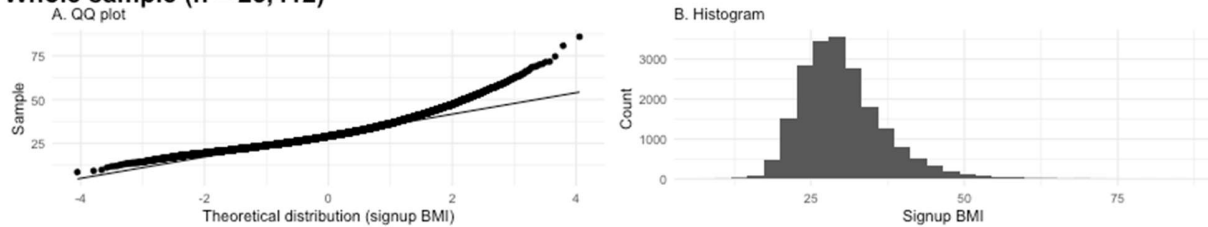
SUPPLEMENTARY FIGURE 3 Correlation matrix for all exposures included in the regression model with the outcome low weight ($n = 19,148$), including the OCD symptoms included only in a sensitivity analysis. All correlations are tetrachoric correlations. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



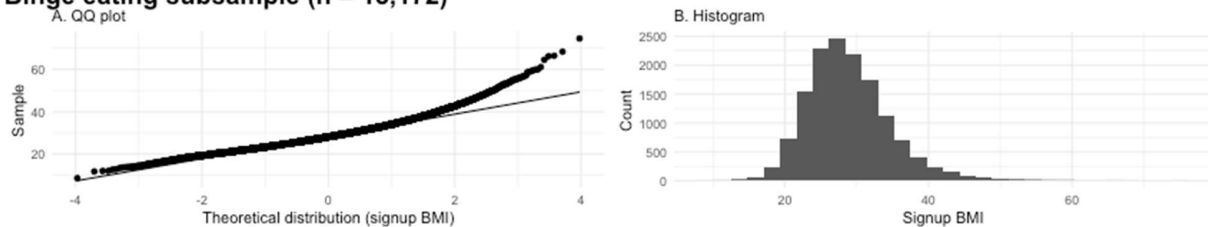
SUPPLEMENTARY FIGURE 4 Correlation matrix for all exposures included in the regression model with the outcome suicidal and/or self-harm ideation ($n = 12,650$). All correlations are tetrachoric correlations. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Below, we have displayed the histograms and Q-Q plots for BMI at registration within the whole sample and within each subsample defined by outcome, calculated to assess normality. BMI at registration violated the assumption of normality, thus we reported medians and interquartile range (IQR).

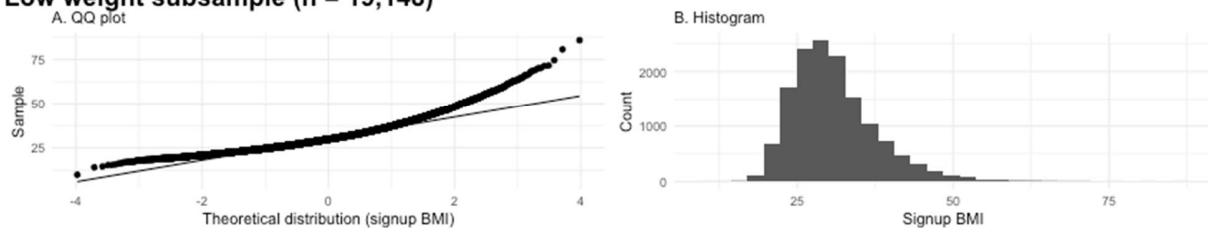
Whole sample (n = 25,412)



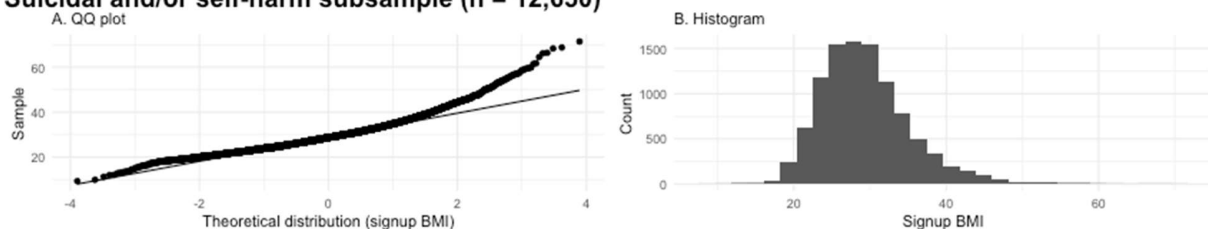
Binge eating subsample (n = 18,172)



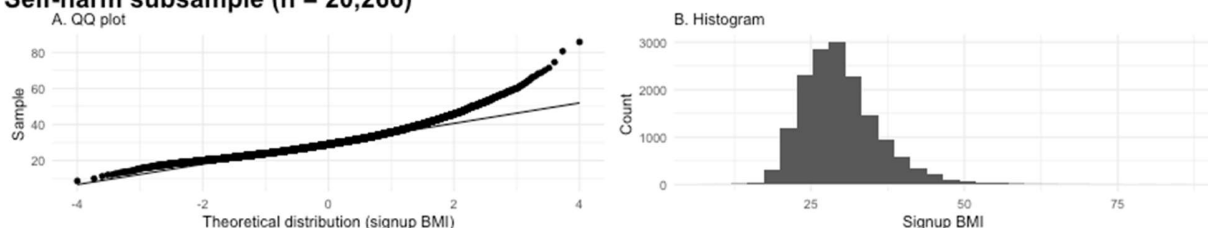
Low weight subsample (n = 19,148)



Suicidal and/or self-harm subsample (n = 12,650)



Self-harm subsample (n = 20,266)



SUPPLEMENTARY FIGURE 6 Histogram and Q-Q plots of BMI at registration in the whole sample ($n = 25,412$) and in each subsample defined by outcome: binge eating ($n = 18,172$), low weight ($n = 19,148$), suicidal and/or self-harm ideation ($n = 12,650$), and self-harm ($n = 20,266$).

2 SUPPLEMENTARY RESULTS

2.1 *N* of exposure split by outcome

SUPPLEMENTARY TABLE 2 Number and percentage of participants in the binge eating subsample ($n = 18,172$) with and without each exposure included in the main analysis, split by those with and without new onset of the outcome.

	N with new onset binge eating (%)	N with no new onset binge eating (%)
Age (years)		
46-55 (reference category)	739 (20.1%)	2,945 (79.9%)
16-25	169 (19.1%)	714 (80.9%)
26-35	323 (18.8%)	1,394 (81.2%)
36-45	434 (20.7%)	1,667 (79.3%)
56-65	810 (15.7%)	4,391 (84.3%)
66-70	312 (13.3%)	2,038 (86.7%)
71+	277 (12.4%)	1,959 (87.6%)
Sex		
Female (reference category)	2,213 (18.4%)	9,789 (81.6%)
Male	851 (13.8%)	5,319 (86.2%)
Minoritised gender		
Yes	28 (19.6%)	115 (80.4%)
No (reference category)	3,036 (16.8%)	14,993 (83.2%)
Racially minoritised		
Yes	108 (23.0%)	362 (77.0%)
No (reference category)	2,956 (16.7%)	14,746 (83.3%)
Psychiatric disorder		
Yes	2,075 (21.6%)	7,523 (78.4%)
No (reference category)	989 (11.5%)	7,585 (88.5%)
Employment		
In paid employment (reference category)	682 (15.4%)	3,736 (84.6%)
Key worker	1,150 (19.0%)	4,894 (81.0%)

Not in paid employment	385 (23.8%)	1,232 (76.2%)
Retired	759 (13.4%)	4,908 (86.6%)
Student	88 (20.7%)	338 (79.3%)
Vulnerable group member		
Yes (reference category)	862 (17.7%)	4,001 (82.3%)
No	2,202 (16.5%)	11,107 (83.5%)
Pandemic loneliness		
Yes	1,319 (19.6%)	5,401 (80.4%)
No (reference category)	1,745 (15.2%)	9,707 (84.8%)
Pandemic worry score		
0-20 (reference category)	600 (11.2%)	4,748 (88.8%)
21-40	1,730 (17.0%)	8,460 (83.0%)
41-60	683 (27.3%)	1,822 (72.7%)
61-80	51 (39.5%)	78 (60.5%)
COVID-19 infection		
Yes	88 (7.4%)	1,110 (92.6%)
No (reference category)	2,976 (17.5%)	13,998 (82.5%)
Loss of loved one/relative due to COVID-19		
Yes	237 (15.3%)	1,312 (84.7%)
No (reference category)	2,827 (17.0%)	13,796 (83.0%)
Change in main economic activity		
Yes	1,319 (18.3%)	5,889 (81.7%)
No (reference category)	1,745 (15.9%)	9,219 (84.1%)
Change in living situation		
Yes	652 (15.0%)	3,692 (85.0%)
No (reference category)	2,412 (17.4%)	11,416 (82.6%)

Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

SUPPLEMENTARY TABLE 3 Number and percentage of participants in the low weight subsample ($n = 19,148$) with and without each exposure included in the main analysis, split by those with and without new onset of the outcome.

	N with new onset low weight (%)	N with no new onset low weight (%)
Age (years)		
46-55 (reference category)	373 (9.3%)	3,628 (90.7%)
16-25	117 (12.4%)	825 (87.6%)
26-35	136 (6.5%)	1,972 (93.5%)
36-45	208 (8.7%)	2,179 (91.3%)
56-65	485 (9.2%)	4,818 (90.8%)
66-70	178 (7.8%)	2,104 (92.2%)
71+	204 (9.6%)	1,919 (90.4%)
Sex		
Female (reference category)	1,104 (8.5%)	11,956 (91.5%)
Male	597 (9.8%)	5,491 (90.2%)
Minoritised gender		
Yes	21 (12.3%)	151 (87.7%)
No (reference category)	1,680 (8.9%)	17,296 (91.1%)
Racially minoritised		
Yes	67 (12.8%)	457 (87.2%)
No (reference category)	1,634 (8.8%)	16,990 (91.2%)
Psychiatric disorder		
Yes	1,118 (10.2%)	9,809 (89.8%)
No (reference category)	583 (7.1%)	7,638 (92.9%)
Employment		
In paid employment (reference category)	330 (7.3%)	4,212 (92.7%)
Key worker	602 (8.9%)	6,152 (91.1%)
Not in paid employment	226 (12.0%)	1,656 (88.0%)
Retired	482 (8.7%)	5,044 (91.3%)

Student	61 (13.7%)	383 (82.3%)
Vulnerable group member		
Yes (reference category)	576 (11.8%)	4,290 (88.2%)
No	1,125 (7.9%)	13,157 (92.1%)
Pandemic loneliness		
Yes	689 (9.4%)	6,668 (90.6%)
No (reference category)	1,012 (8.6%)	10,779 (91.4%)
Pandemic worry score		
0-20 (reference category)	342 (6.5%)	4,903 (93.5%)
21-40	917 (8.6%)	9,784 (91.4%)
41-60	407 (13.5%)	2,619 (86.5%)
61-80	35 (19.9%)	141 (80.1%)
COVID-19 infection		
Yes	71 (5.1%)	1,325 (94.9%)
No (reference category)	1,630 (9.2%)	16,122 (90.8%)
Loss of loved one/relative due to COVID-19		
Yes	151 (8.5%)	1,629 (91.5%)
No (reference category)	1,550 (8.9%)	15,818 (91.1%)
Change in main economic activity		
Yes	722 (9.1%)	7,198 (90.9%)
No (reference category)	979 (8.7%)	10,249 (91.3%)
Change in living situation		
Yes	389 (8.1%)	4,399 (91.9%)
No (reference category)	1,313 (9.1%)	13,048 (90.9%)

Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

SUPPLEMENTARY TABLE 4 Number and percentage of participants in the suicidal and/or self-harm ideation subsample ($n = 12,650$) with and without each exposure included in the main analysis, split by those with and without new onset of the outcome.

	N with new onset suicidal and/or self-harm ideation (%)	N with no new onset suicidal and/or self-harm ideation (%)
Age (years)		
46-55 (reference category)	692 (27.5%)	1,828 (72.5%)
16-25	232 (54.3%)	195 (45.7%)
26-35	405 (38.3%)	651 (61.7%)
36-45	471 (34.1%)	909 (65.9%)
56-65	889 (23.7%)	2,869 (76.3%)
66-70	348 (19.3%)	1,460 (80.7%)
71+	329 (19.3%)	1,372 (80.7%)
Sex		
Female (reference category)	2,530 (31.1%)	5,604 (68.9%)
Male	836 (18.5%)	3,680 (81.5%)
Minoritised gender		
Yes	30 (61.2%)	19 (38.8%)
No (reference category)	3,336 (26.5%)	9,265 (73.5%)
Racially minoritised		
Yes	112 (38.6%)	178 (61.4%)
No (reference category)	3,254 (26.3%)	9,106 (73.7%)
Psychiatric disorder		
Yes	2,500 (47.2%)	2,799 (52.8%)
No (reference category)	866 (11.8%)	6,485 (88.2%)
Employment		
In paid employment (reference category)	833 (27.3%)	2,219 (72.7%)
Key worker	1,152 (27.2%)	3,084 (72.8%)

Not in paid employment	393 (44.2%)	497 (55.8%)
Retired	882 (20.6%)	3,395 (79.4%)
Student	106 (54.4%)	89 (45.6%)
Vulnerable group member		
Yes (reference category)	924 (26.3%)	2,585 (73.7%)
No	2,442 (26.7%)	6,699 (73.3%)
Pandemic loneliness		
Yes	1,514 (34.1%)	2,932 (65.9%)
No (reference category)	1,852 (22.6%)	6,352 (77.4%)
Pandemic worry score		
0-20 (reference category)	622 (14.8%)	3,588 (85.2%)
21-40	1,964 (28.5%)	4,937 (71.5%)
41-60	727 (49.9%)	731 (50.1%)
61-80	53 (64.4%)	28 (34.6%)
COVID-19 infection		
Yes	63 (8.4%)	689 (91.6%)
No (reference category)	3,303 (27.8%)	8,595 (72.2%)
Loss of loved one/relative due to COVID-19		
Yes	174 (17.4%)	827 (82.6%)
No (reference category)	3,192 (27.4%)	8,457 (72.6%)
Change in main economic activity		
Yes	1,383 (31.0%)	3,083 (69.0%)
No (reference category)	1,983 (24.2%)	6,201 (75.8%)
Change in living situation		
Yes	622 (24.3%)	1,939 (75.7%)
No (reference category)	2,744 (27.2%)	7,345 (72.8%)

Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

SUPPLEMENTARY TABLE 5 Number and percentage of participants in the self-harm subsample ($n = 12,650$) with and without each exposure included in the main analysis, split by those with and without new onset of the outcome.

	N with new onset self-harm (%)	N with no new onset self-harm (%)
Age (years)		
46-55 (reference category)	151 (3.5%)	4,209 (96.5%)
16-25	72 (10.2%)	634 (89.8%)
26-35	120 (6.5%)	1,713 (93.5%)
36-45	109 (4.5%)	2,335 (95.5%)
56-65	129 (2.2%)	5,849 (97.8%)
66-70	44 (1.7%)	2,510 (98.3%)
71+	36 (1.5%)	2,355 (98.5%)
Sex		
Female (reference category)	480 (3.5%)	13,097 (96.5%)
Male	181 (2.7%)	6,508 (97.3%)
Minoritised gender		
Yes	6 (5.3%)	107 (94.7%)
No (reference category)	655 (3.2%)	19,498 (96.8%)
Racially minoritised		
Yes	26 (4.8%)	514 (95.2%)
No (reference category)	635 (3.2%)	19,091 (96.8%)
Psychiatric disorder		
Yes	511 (4.6%)	10,581 (95.4%)
No (reference category)	150 (1.6%)	9,024 (98.4%)
Employment		
In paid employment (reference category)	174 (3.6%)	4,671 (96.4%)
Key worker	245 (3.4%)	6,980 (96.6%)

Not in paid employment	93 (5.4%)	1,626 (94.6%)
Retired	110 (1.8%)	6,035 (98.2%)
Student	39 (11.7%)	293 (88.3%)
Vulnerable group member		
Yes (reference category)	161 (2.9%)	5,353 (97.1%)
No	500 (3.4%)	14,252 (96.6%)
Pandemic loneliness		
Yes	303 (4.0%)	7257 (96.0%)
No (reference category)	358 (2.8%)	12,348 (97.2%)
Pandemic worry score		
0-20 (reference category)	118 (2.1%)	5,588 (97.9%)
21-40	364 (3.2%)	11,043 (96.8%)
41-60	163 (5.5%)	2,817 (94.5%)
61-80	16 (9.3%)	157 (90.7%)
COVID-19 infection		
Yes	24 (1.6%)	1,449 (98.4%)
No (reference category)	637 (3.4%)	18,156 (96.6%)
Loss of loved one/relative due to COVID-19		
Yes	62 (3.2%)	1,854 (96.8%)
No (reference category)	599 (3.3%)	17,751 (96.7%)
Change in main economic activity		
Yes	324 (4.0%)	7,784 (96.0%)
No (reference category)	337 (2.8%)	11,821 (97.2%)
Change in living situation		
Yes	167 (3.4%)	4,697 (96.6%)
No (reference category)	494 (3.2%)	14,908 (96.8%)

Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

2.2 Sensitivity analysis results

Excluding GLAD and EDGI UK survey participants. We first compared our logistic regression results from our main analysis to the results from the sensitivity analyses in which we excluded participants not ascertained for having a psychiatric disorder (binge eating $n = 13,240$; low weight $n = 13,473$; suicidal and/or self-harm ideation $n = 10,401$; self-harm $n = 14,656$; Supplementary Figures 7-10). The odds ratios of both analyses were highly correlated across all models ($r = 0.94$ - 0.98 ; Supplementary Figure 11-14), indicating that our analyses were not sensitive to ascertainment bias in terms of psychiatric disorders.

Excluding participants with IBD. Next, we compared our main logistic regression results to the results from the sensitivity analyses (Supplementary Figures 15-18) in which we excluded participants from the inflammatory bowel disease cohort ($n = 1,764$) and who self-reported a diagnosis of inflammatory bowel disease ($n = 511$). This resulted in the following sample sizes: binge eating $n = 16,502$; low weight $n = 17,825$; suicidal and/or self-harm ideation $n = 11,254$; self-harm $n = 18,238$. The odds ratios of both analyses were highly correlated across all models ($r = 0.99$; Supplementary Figures 19-22), indicating that our analyses were not sensitive to ascertainment bias in terms of inflammatory bowel disease.

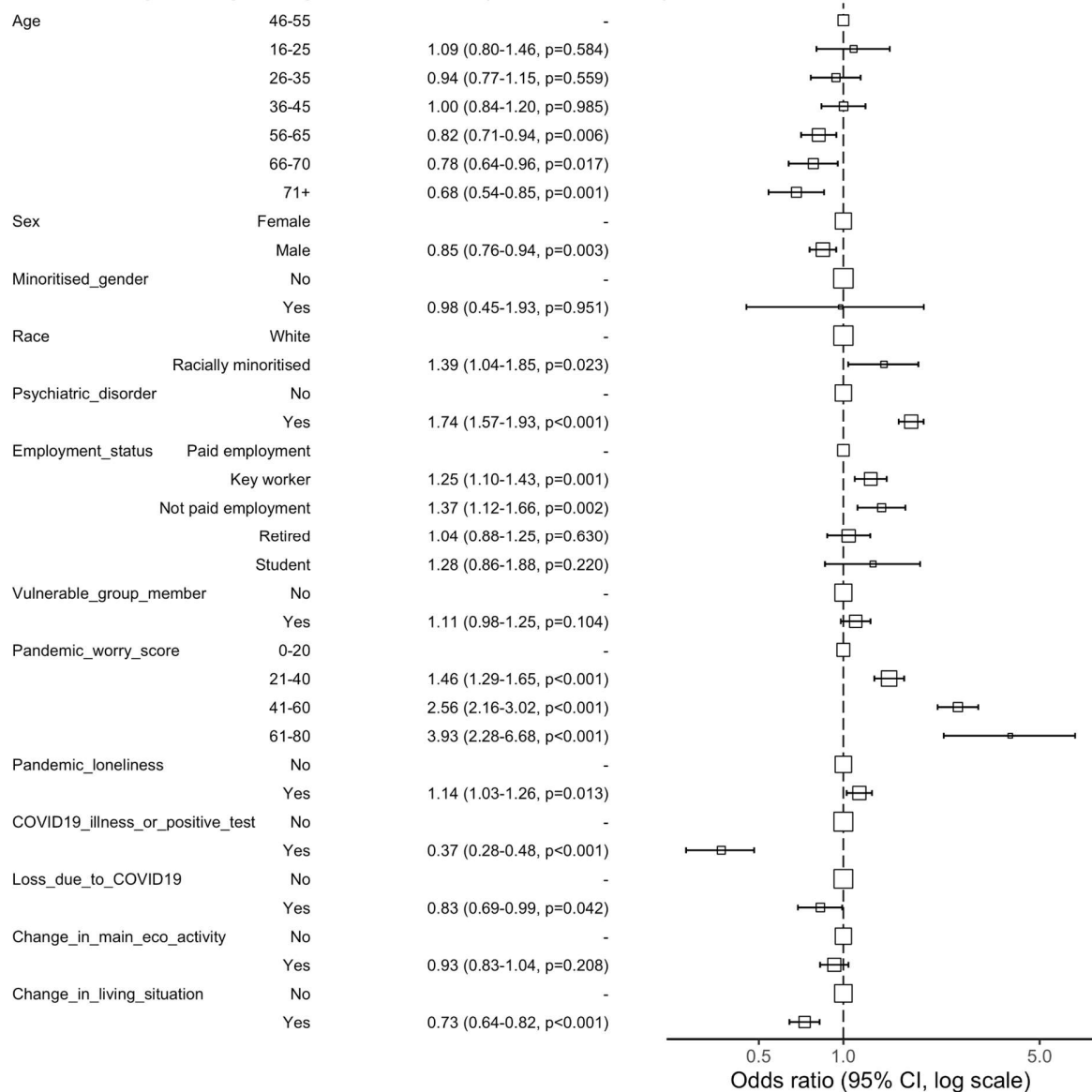
Missing data. Next, we compared our main analysis results to the results from the sensitivity analyses in which we specified that participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period (binge eating $n = 16,332$; low weight $n = 16,804$; suicidal and/or self-harm ideation $n = 13,082$; self-harm $n = 18,758$; Supplementary Figures 23-26). The odds ratios of both analyses were highly correlated across all models ($r = 0.98$ - 0.99 ; Supplementary Figures 27-30), indicating that our analyses were not sensitive to missing data.

Exposure before outcome. Third, we compared our main analysis results to our results from another sensitivity analysis whereby we only included instances in which the outcome was first reported in a phase after the exposure was first reported (binge eating $n = 17,861$; low weight $n = 18,971$; suicidal and/or self-harm ideation $n = 13,002$; self-harm $n = 19,054$; Supplementary Figures 31-34). The odds ratios of both analyses were highly correlated across all models ($r = 0.97$ - 0.99 ; Supplementary Figures 35-38), indicating that our analyses were robust to attempts to further limit the possibility of reverse causality.

Highest education. In our sensitivity analysis in which we excluded participants aged 16-25 because their education may not have been finished at that timepoint and included highest education as an exposure (binge eating $n = 17,284$; low weight $n = 18,199$; suicidal and/or self-harm ideation $n = 12,878$; self-harm $n = 18,552$; Supplementary Figures 39-42), the odds ratios were highly correlated with those from the main analysis ($r = 0.98$ - 0.99 ; Supplementary Figures 43-46). Therefore, our analyses were not sensitive to controlling for highest education.

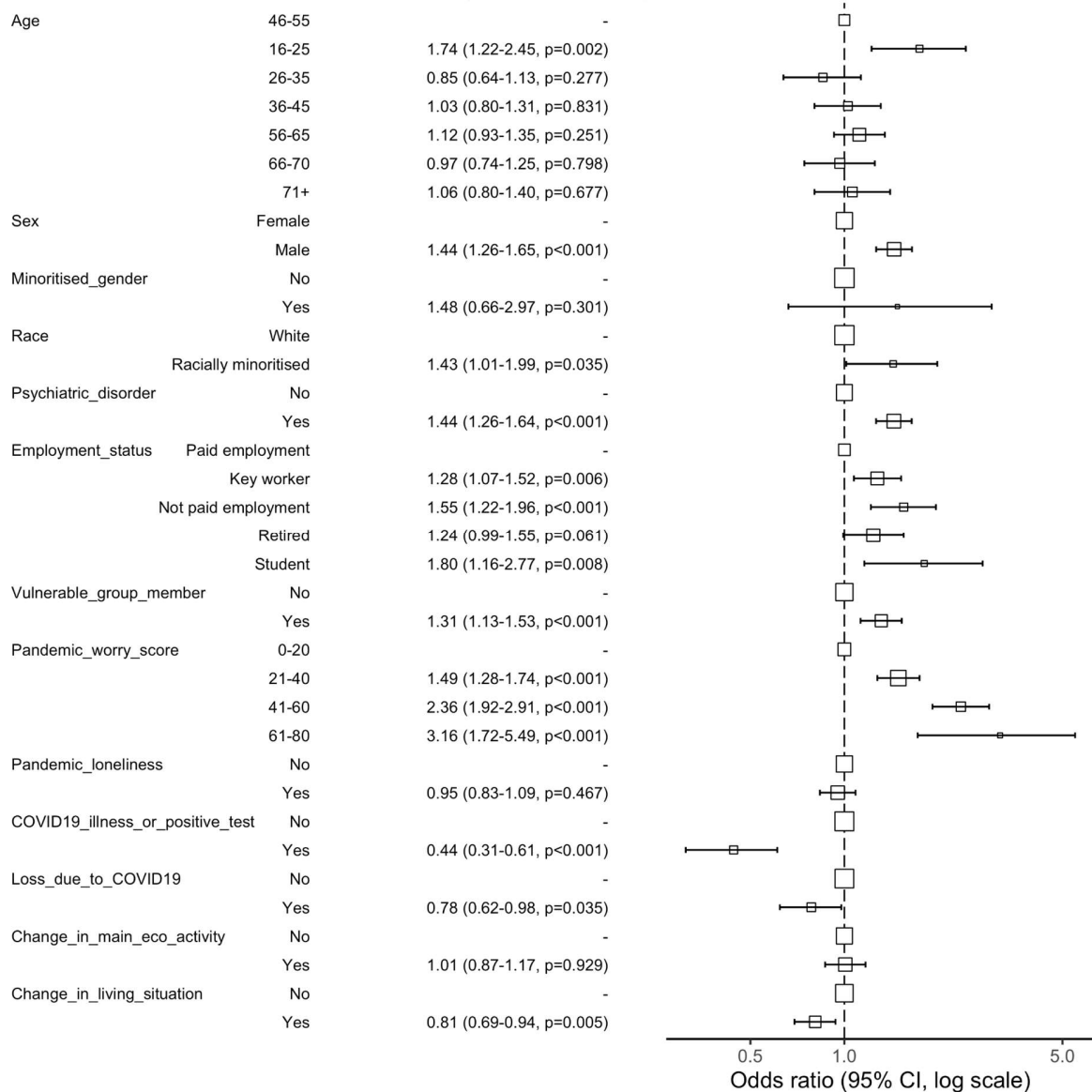
OCD symptoms. For the model in which low weight was the outcome, the odds ratios from a sensitivity analysis that included OCD as an exposure (Supplementary Figure 47) were highly correlated with those from the main analysis ($n = 16,345$; $r = 0.99$; Supplementary Figure 48), indicating that our results were not sensitive to controlling for OCD symptoms.

New onset binge eating during pandemic: OR (95% CI, p-value)



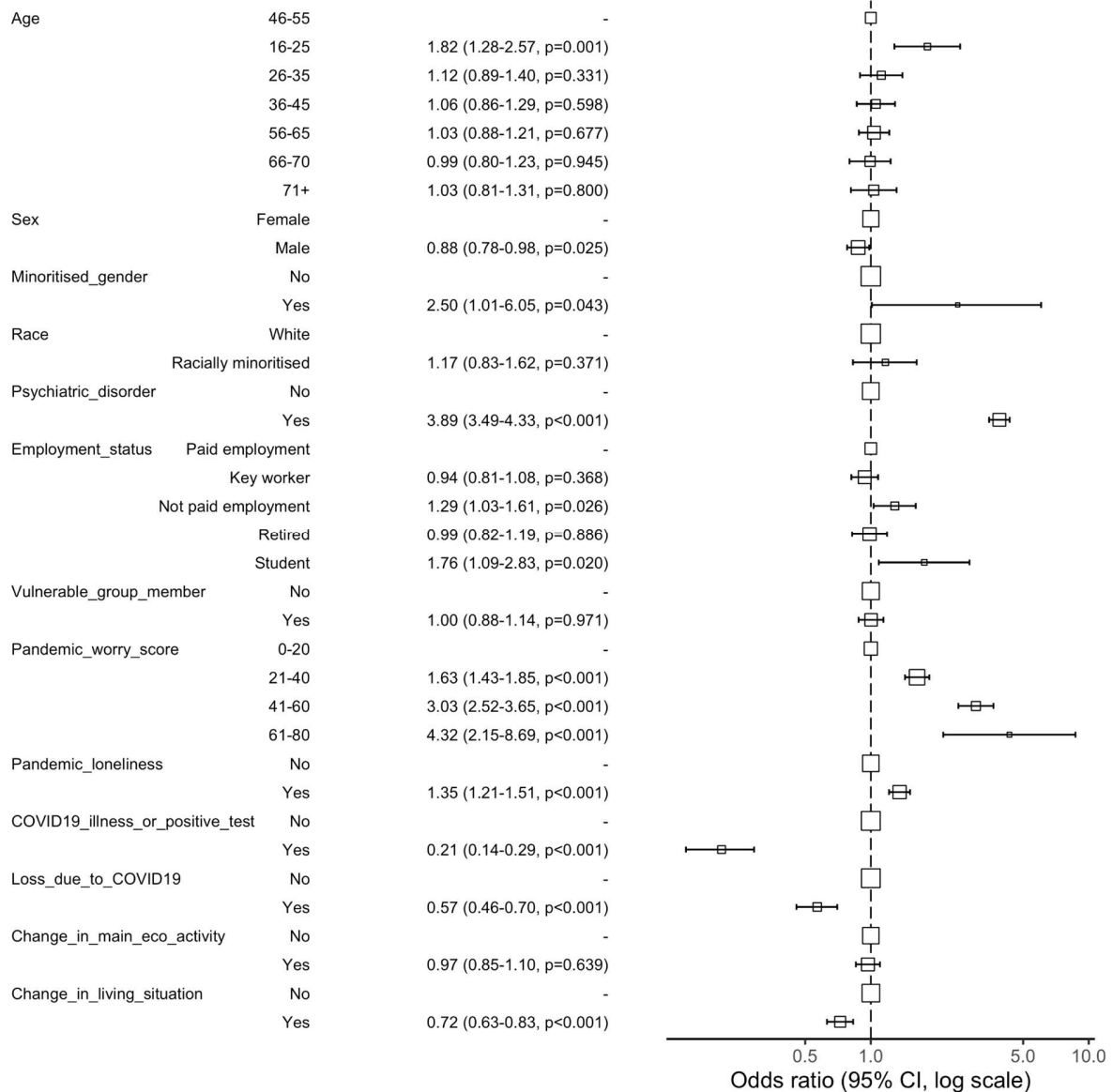
SUPPLEMENTARY FIGURE 7 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants ascertained for having a psychiatric disorder ($n = 13,240$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

New onset low weight during pandemic: OR (95% CI, p-value)



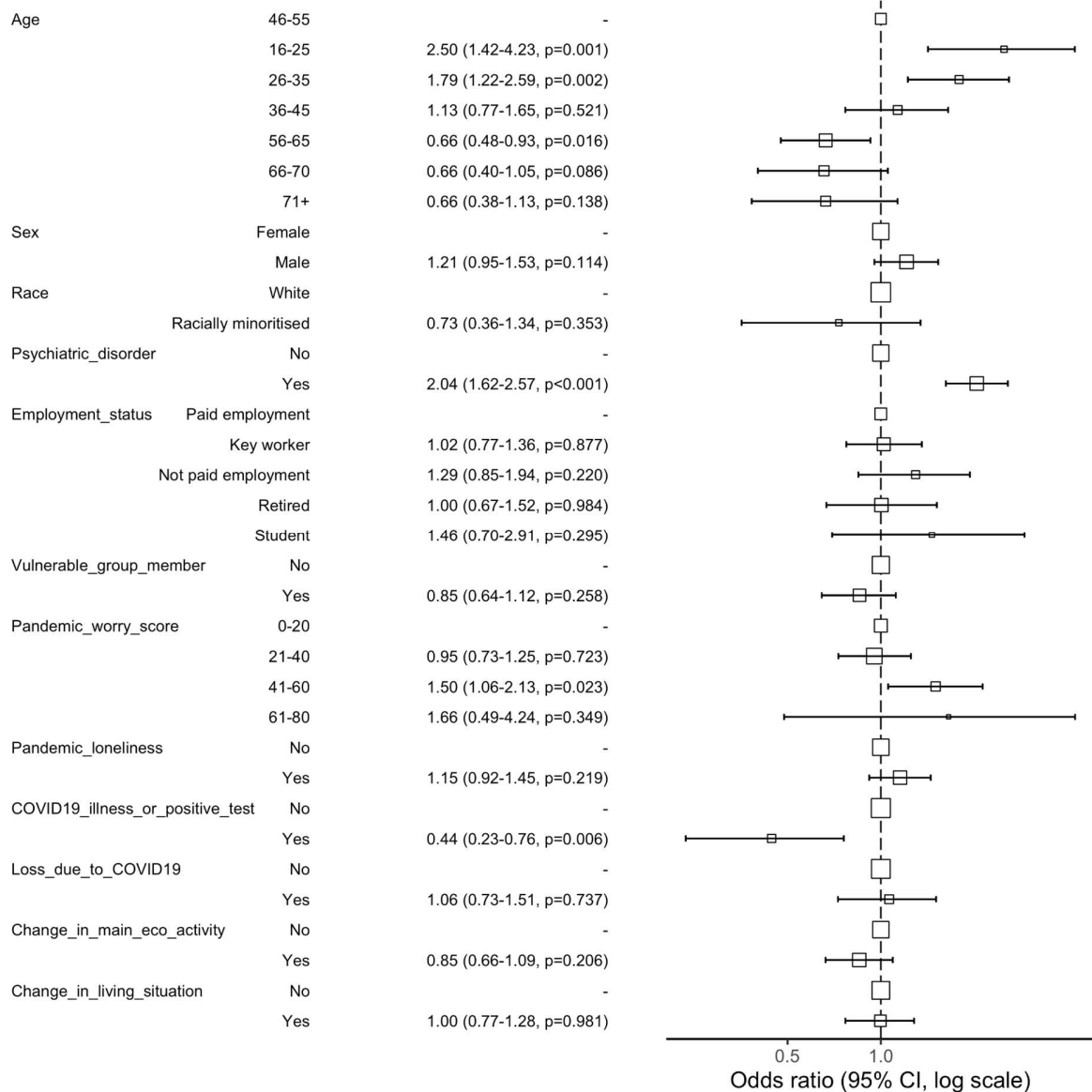
SUPPLEMENTARY FIGURE 8 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants ascertained for having a psychiatric disorder ($n = 13,473$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

New onset suicidal and/or self-harm ideation during pandemic: OR (95% CI, p-value)

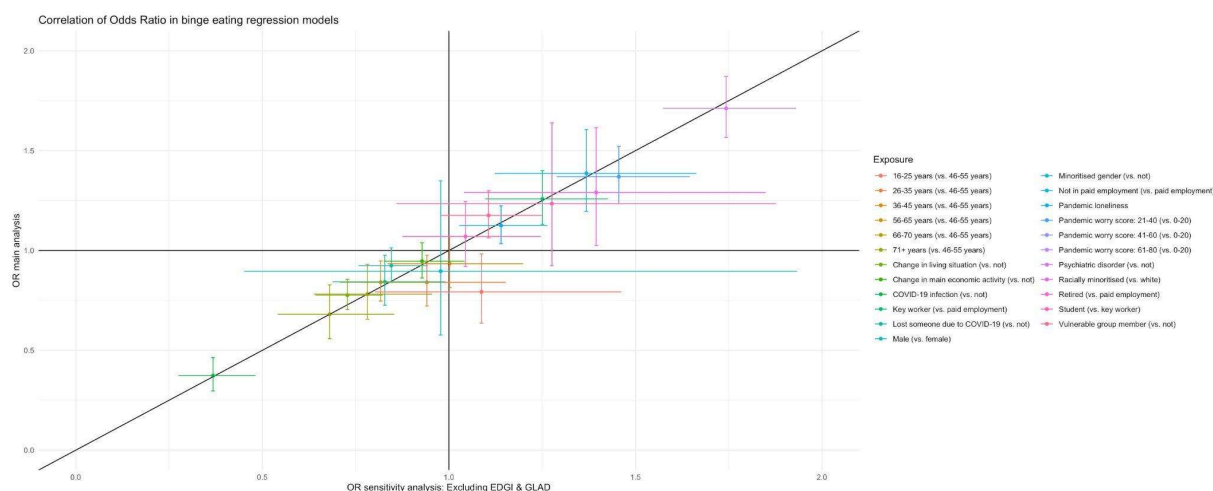


SUPPLEMENTARY FIGURE 9 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants ascertained for having a psychiatric disorder ($n = 10,401$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

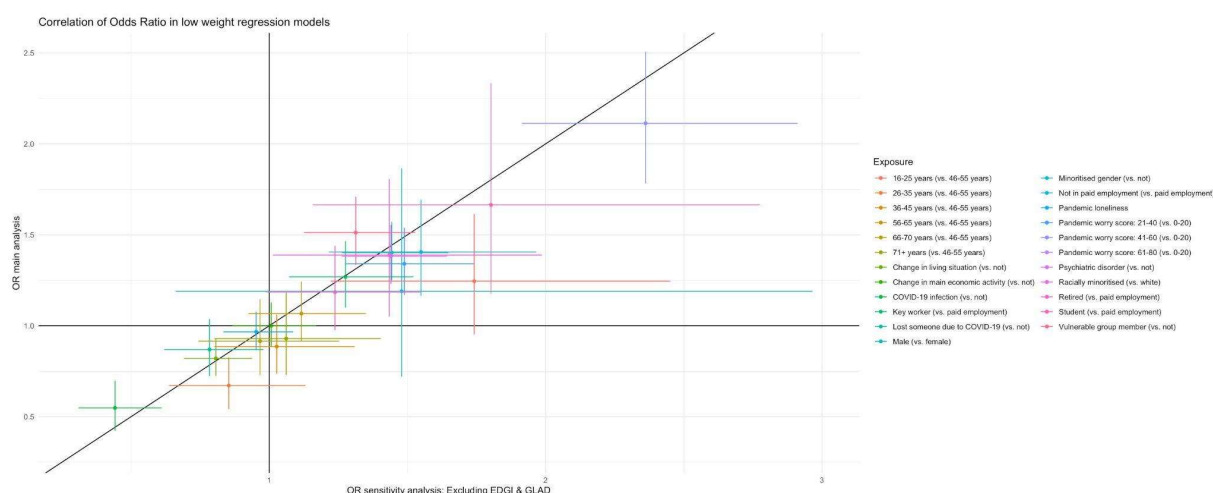
New onset self-harm during pandemic: OR (95% CI, p-value)



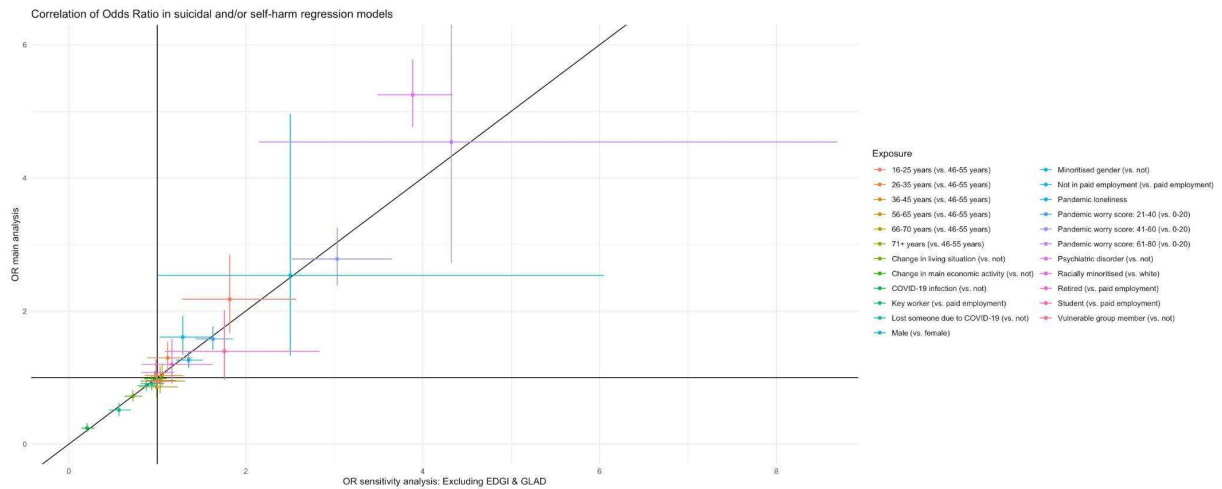
SUPPLEMENTARY FIGURE 10 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants ascertained for having a psychiatric disorder ($n = 14,656$). Note. The size of the squares reflects the number of participants in each group; 'Minoritised gender' is not included because the sample size was too small; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



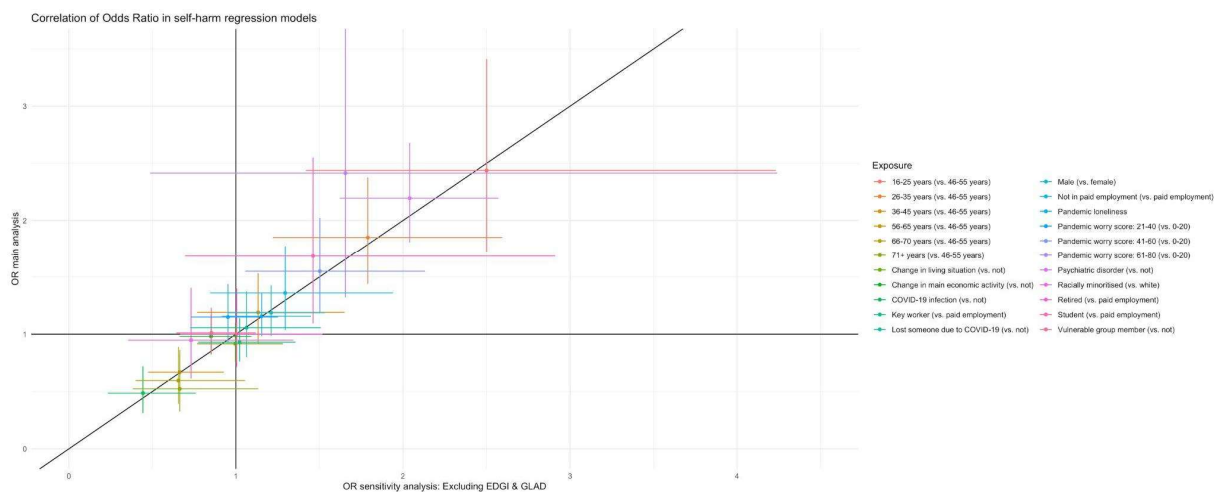
SUPPLEMENTARY FIGURE 11 Sensitivity analysis comparing the binge eating logistic regression results from the main analysis ($n = 18,172$) to a sensitivity analysis in which participants ascertained for having a psychiatric disorder were excluded ($n = 13,240$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



SUPPLEMENTARY FIGURE 12 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which participants ascertained for having a psychiatric disorder were excluded ($n = 13,473$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

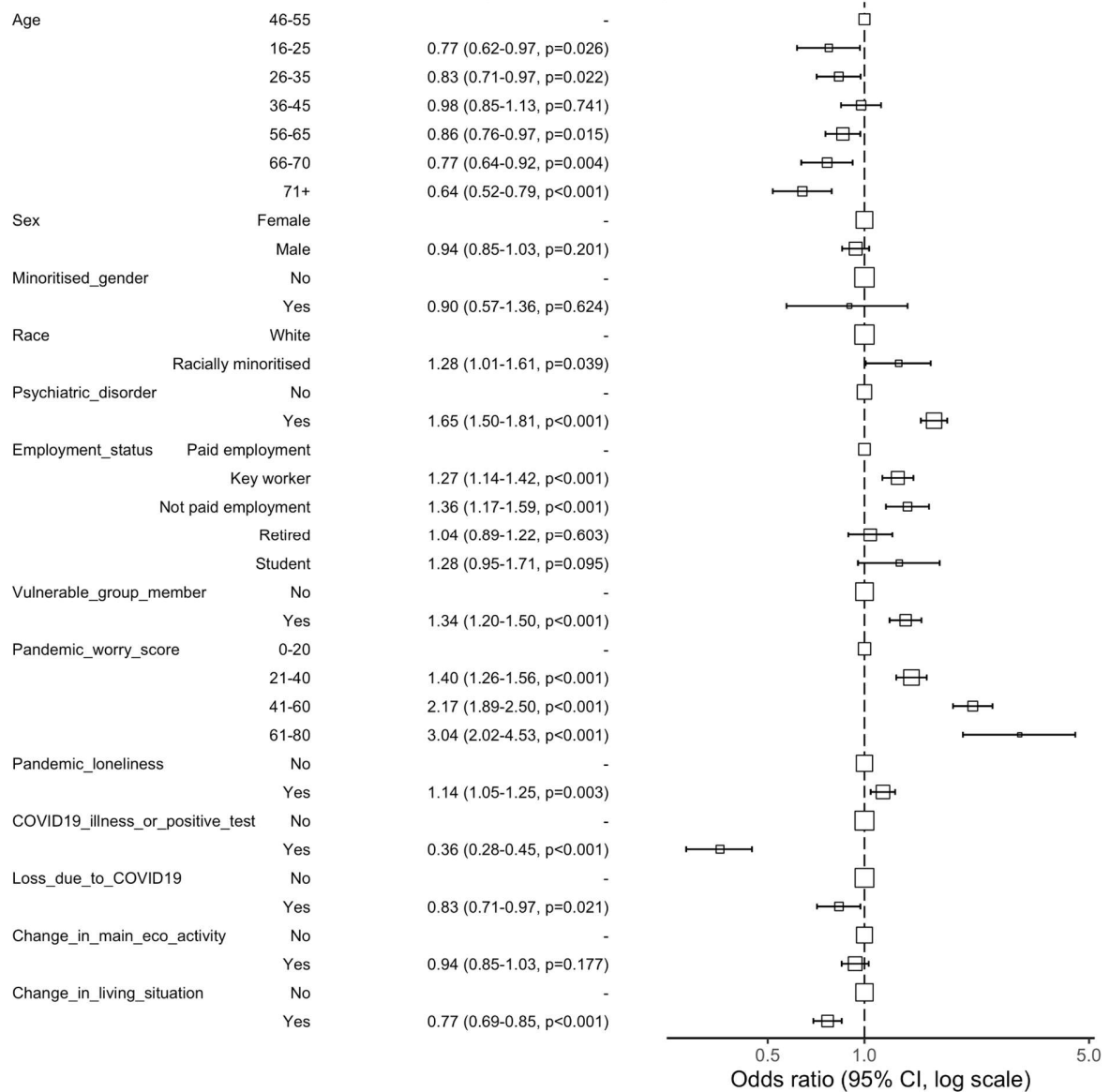


SUPPLEMENTARY FIGURE 13 Sensitivity analysis comparing the suicidal and/or self-harm logistic regression results from the main analysis ($n = 12,650$) to a sensitivity analysis in which participants ascertained for having a psychiatric disorder were excluded ($n = 10,401$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



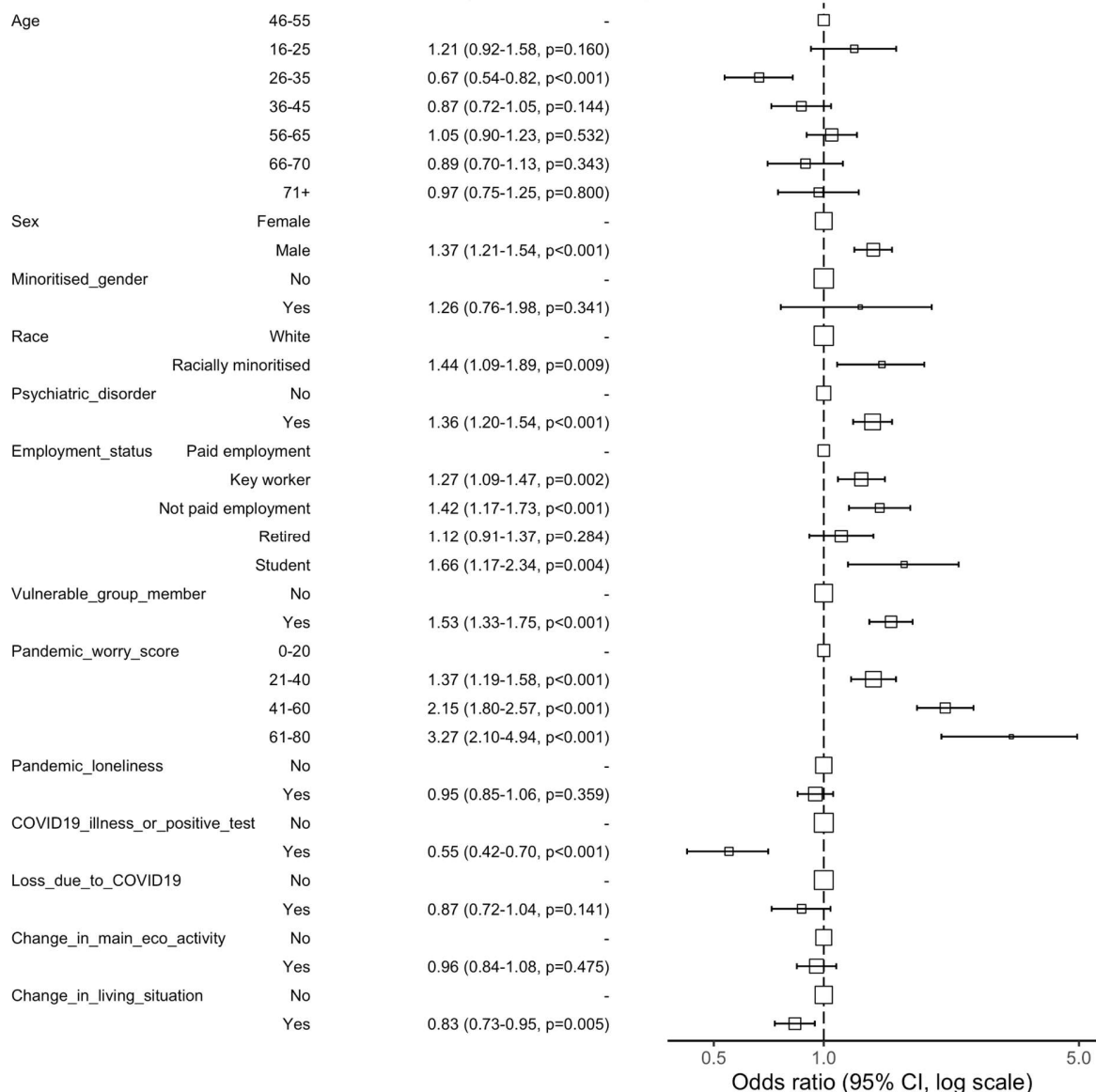
SUPPLEMENTARY FIGURE 14 Sensitivity analysis comparing the self-harm logistic regression results from the main analysis ($n = 20,266$) to a sensitivity analysis in which participants ascertained for having a psychiatric disorder were excluded ($n = 14,656$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. 'Minoritised gender' is not included because the sample size was too small; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

New onset binge eating during pandemic: OR (95% CI, p-value)



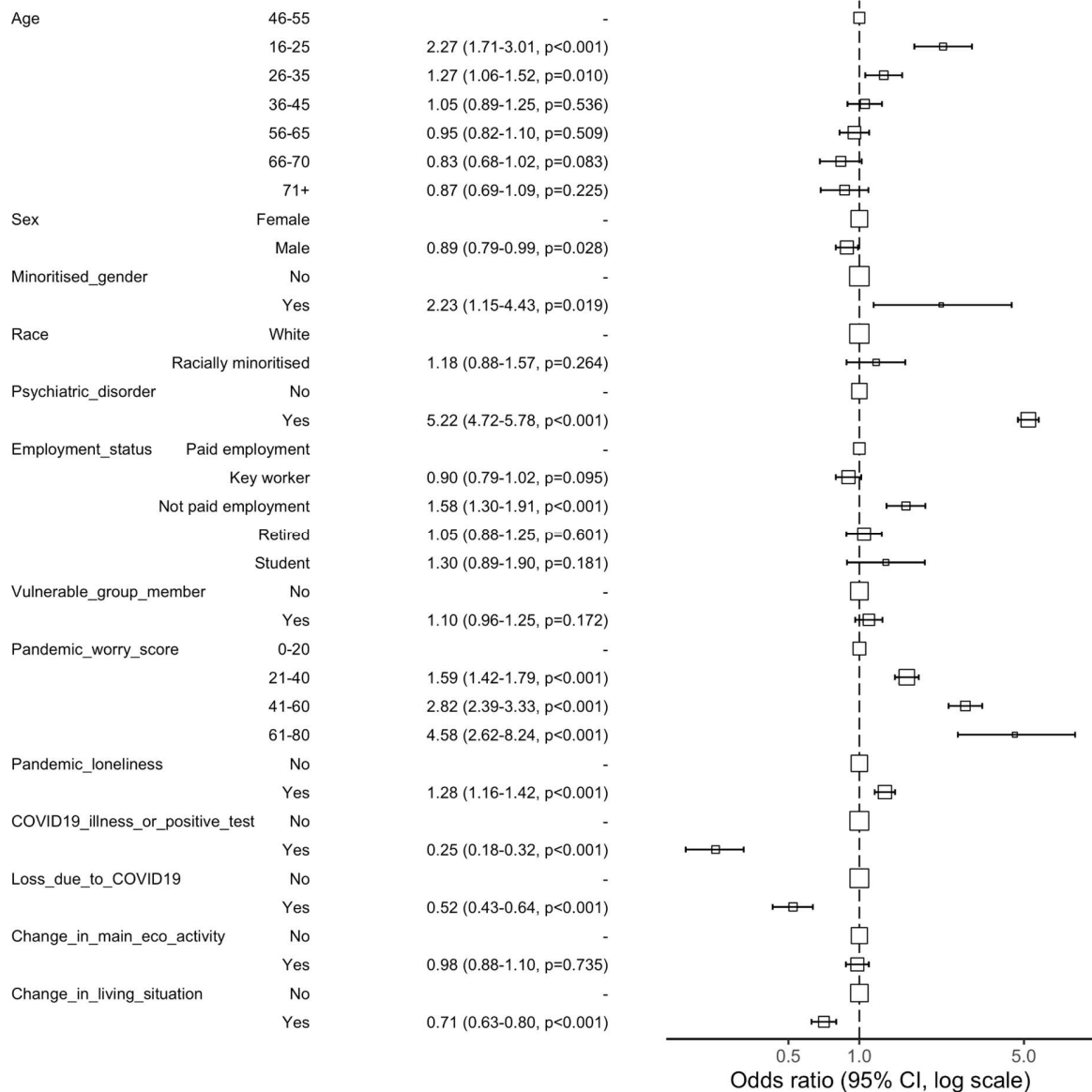
SUPPLEMENTARY FIGURE 15 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 16,502$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

New onset low weight during pandemic: OR (95% CI, p-value)



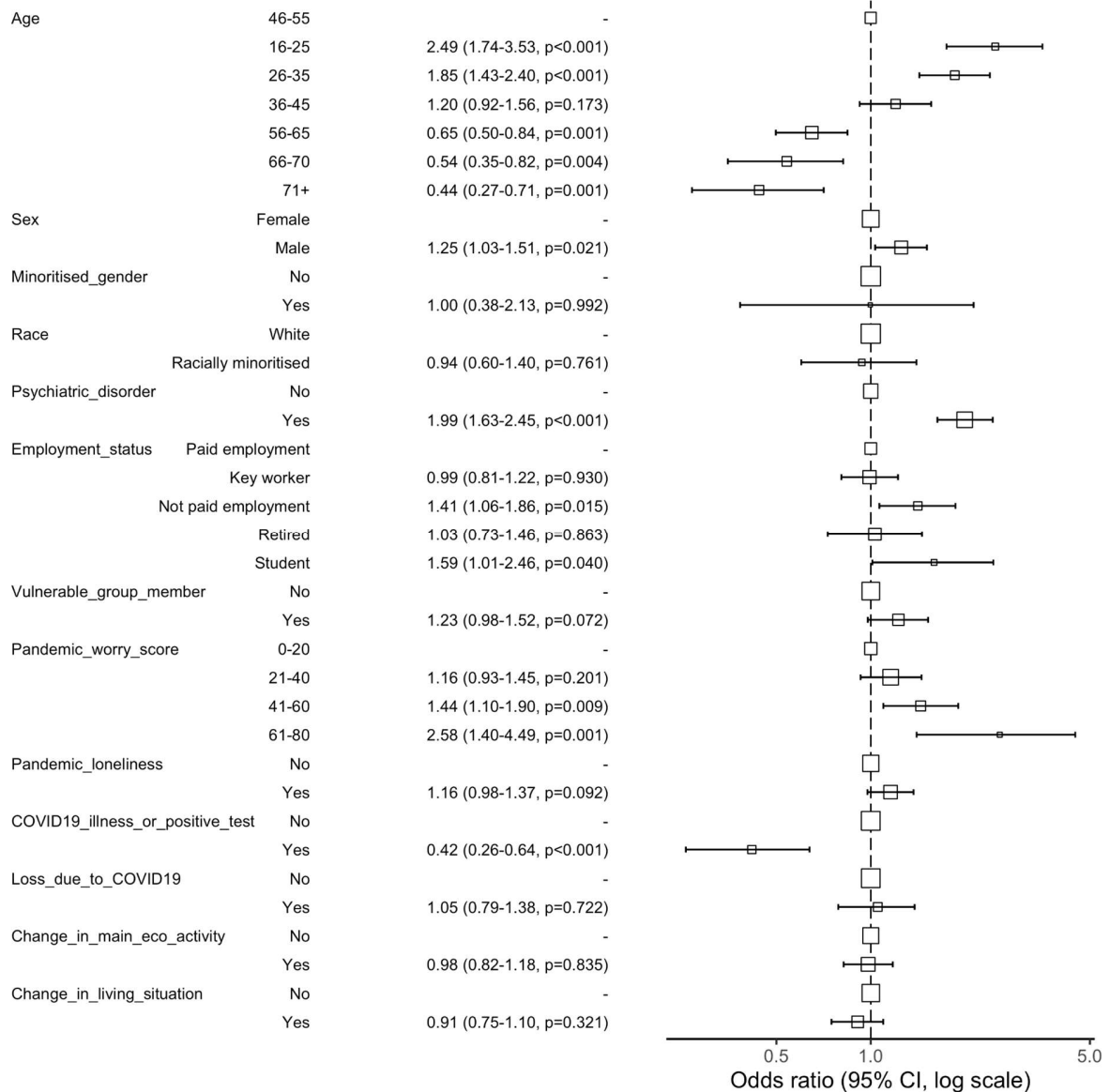
SUPPLEMENTARY FIGURE 16 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 17,825$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

New onset suicidal and/or self-harm ideation during pandemic: OR (95% CI, p-value)

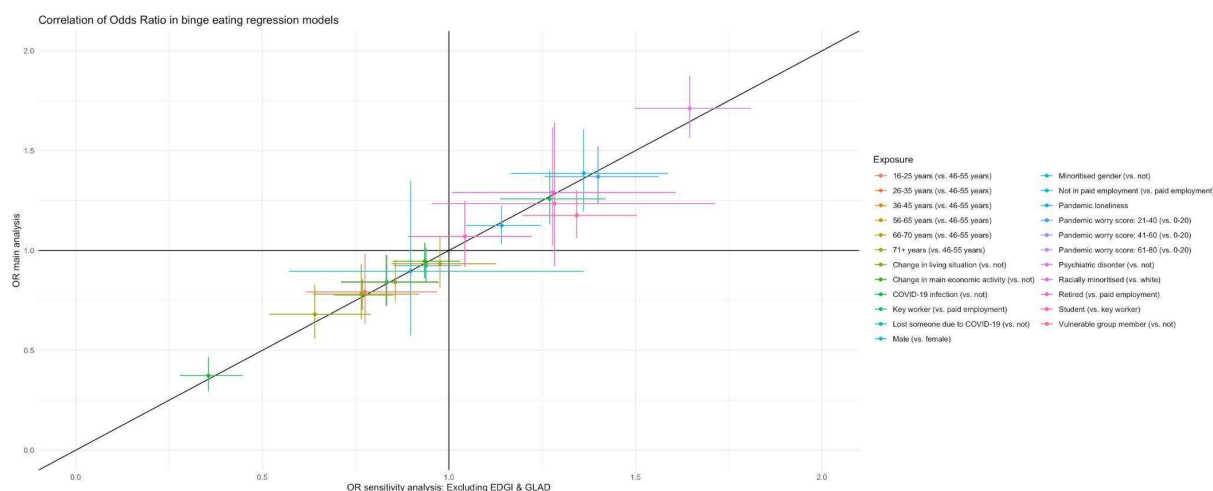


SUPPLEMENTARY FIGURE 17 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 11,254$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

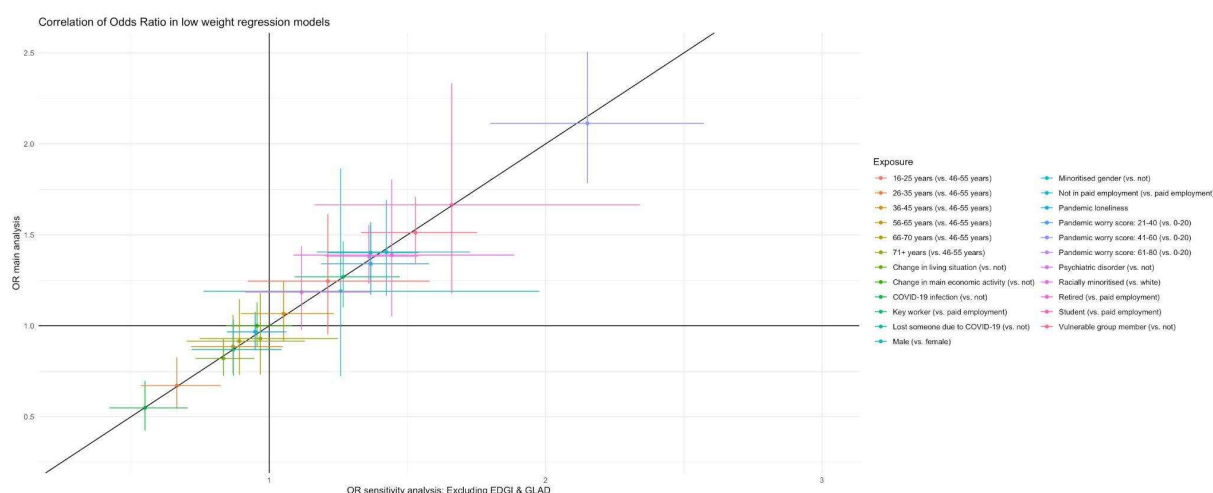
New onset self-harm during pandemic: OR (95% CI, p-value)



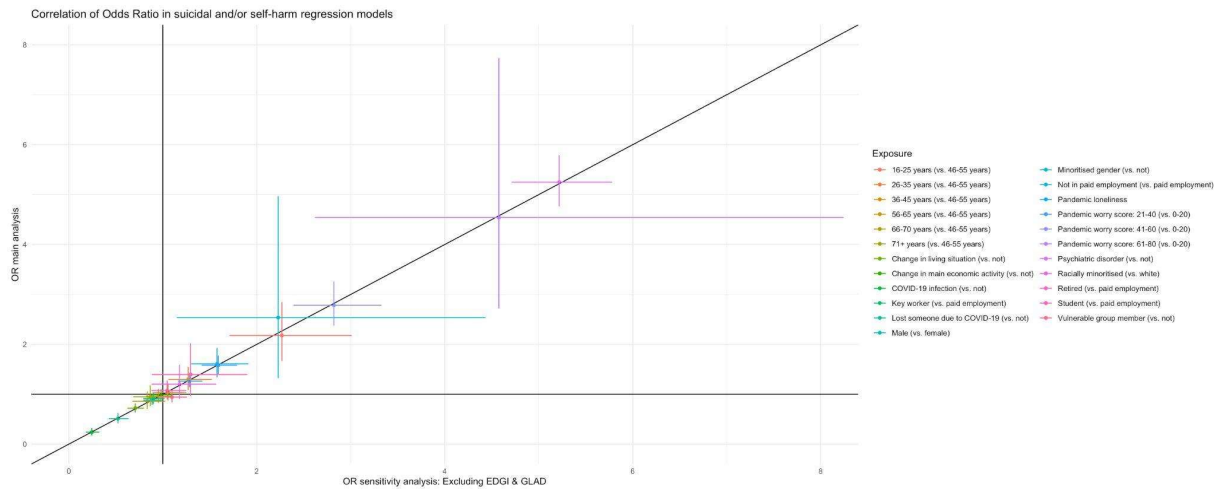
SUPPLEMENTARY FIGURE 18 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 18,238$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



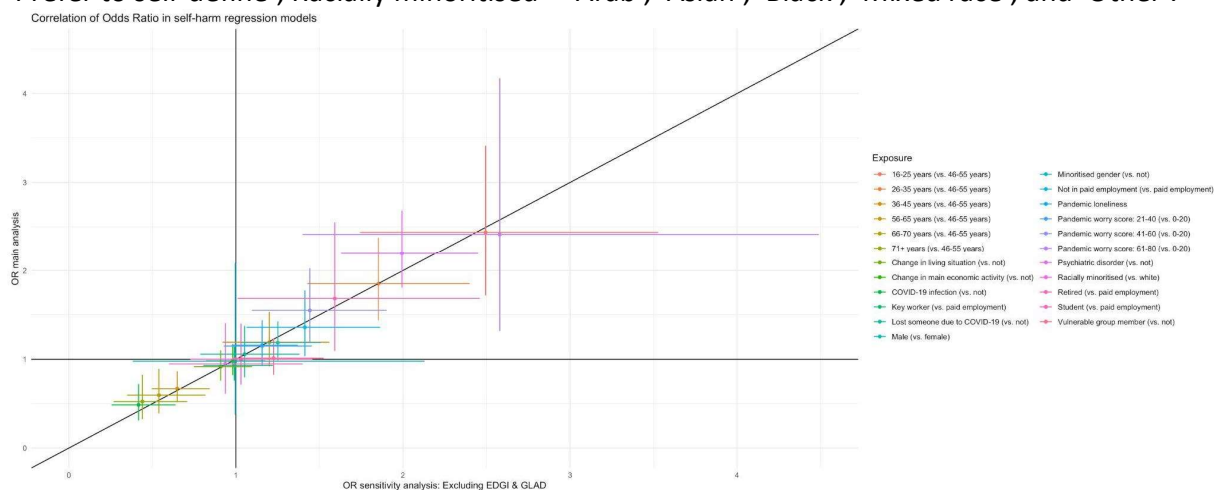
SUPPLEMENTARY FIGURE 19 Sensitivity analysis comparing the binge eating logistic regression results from the main analysis ($n = 18,172$) to a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 16,502$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



SUPPLEMENTARY FIGURE 20 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 17,825$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

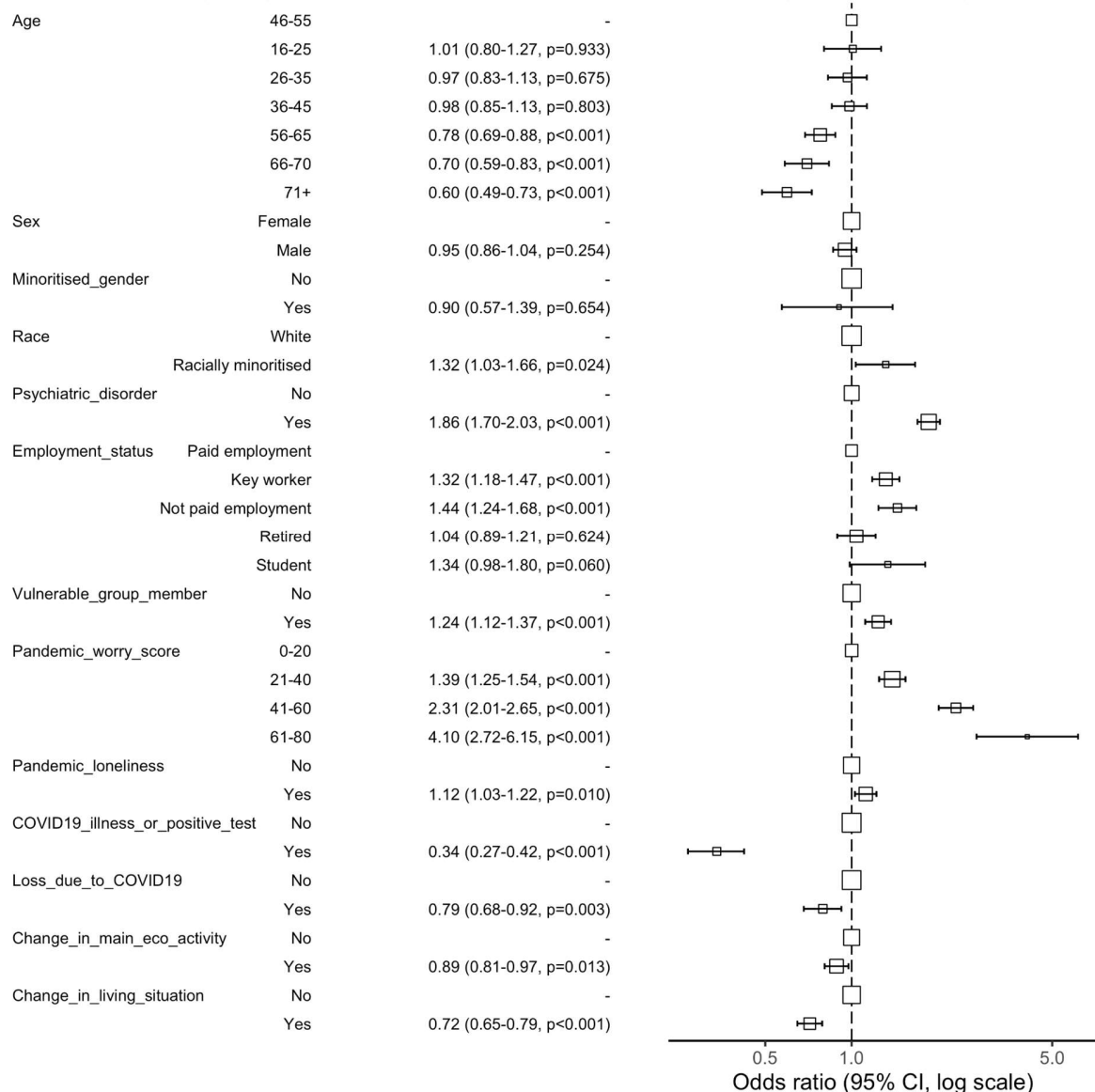


SUPPLEMENTARY FIGURE 21 Sensitivity analysis comparing the suicidal and/or self-harm logistic regression results from the main analysis ($n = 12,650$) to a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 11,254$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = ‘Transgender’, ‘Non-binary’, and ‘Prefer to self-define’; Racially minoritised = ‘Arab’, ‘Asian’, ‘Black’, ‘Mixed race’, and ‘Other’.



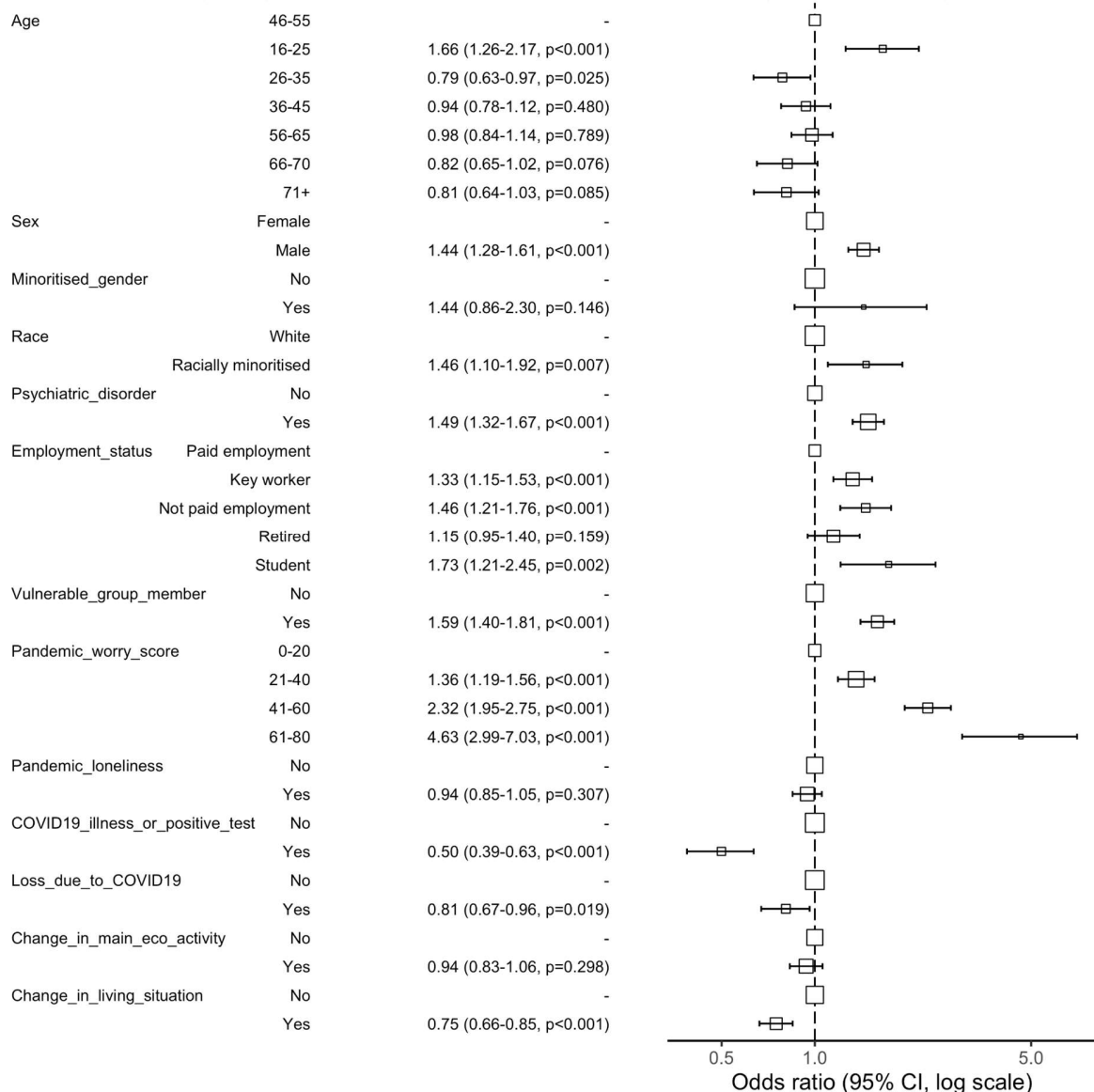
SUPPLEMENTARY FIGURE 22 Sensitivity analysis comparing the self-harm logistic regression results from the main analysis ($n = 20,266$) to a sensitivity analysis in which we excluded individuals with inflammatory bowel disease ($n = 18,238$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = ‘Transgender’, ‘Non-binary’, and ‘Prefer to self-define’; Racially minoritised = ‘Arab’, ‘Asian’, ‘Black’, ‘Mixed race’, and ‘Other’.

Sensitivity analysis (3 nos): New onset binge eating during pandemic: OR (95% CI, p-value)



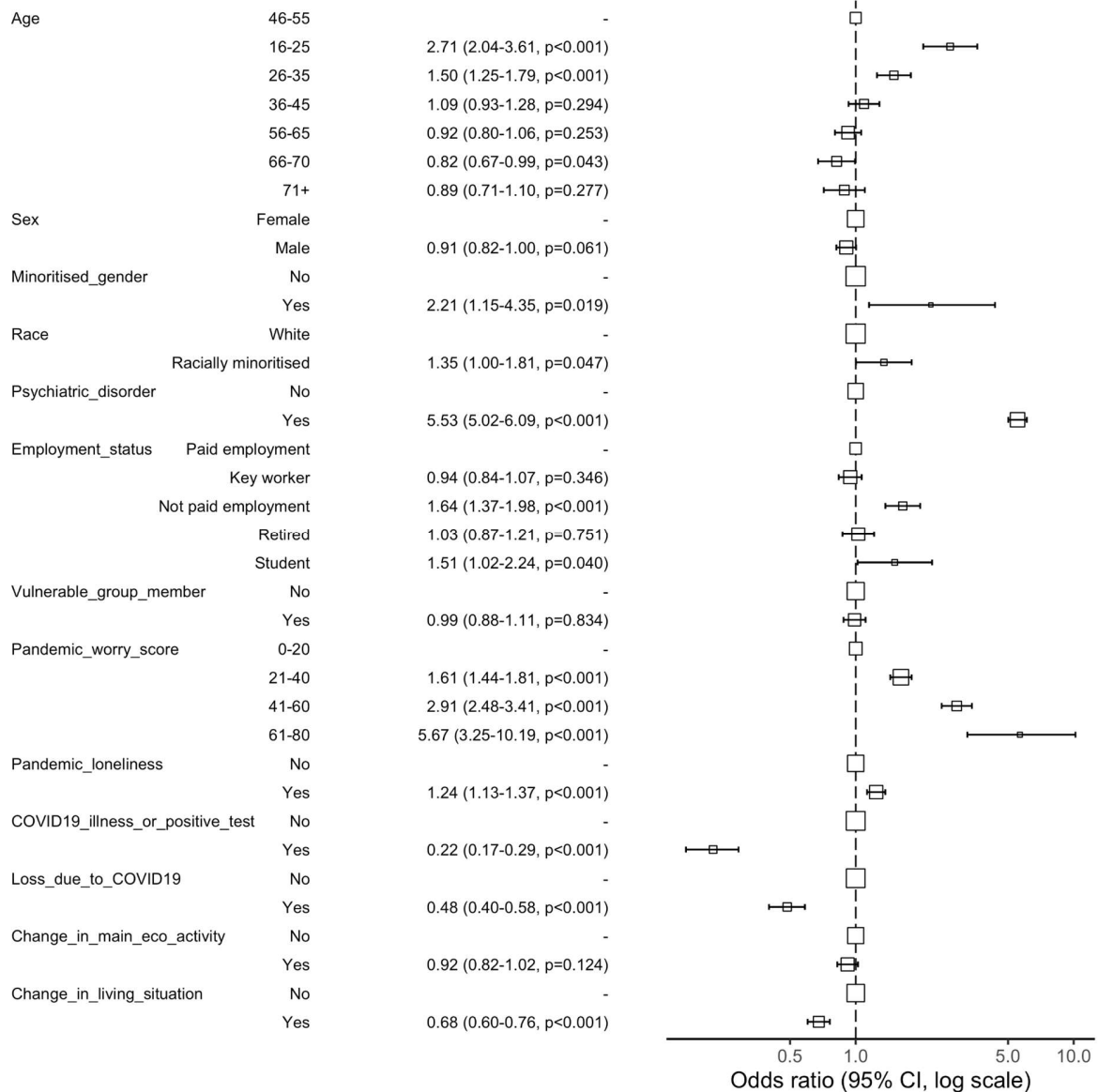
SUPPLEMENTARY FIGURE 23 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 16,332$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (3 nos): New onset low weight during pandemic: OR (95% CI, p-value)



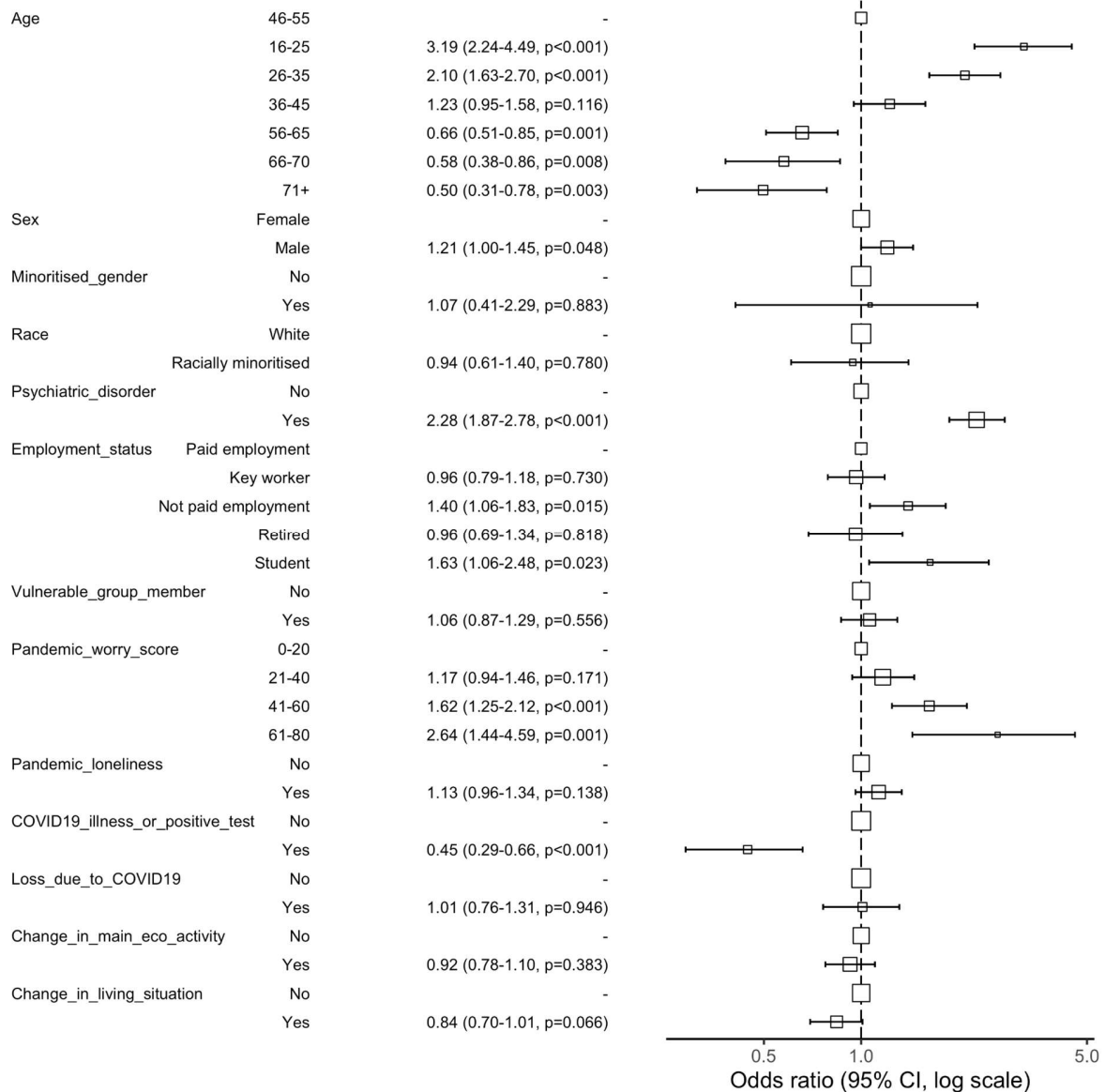
SUPPLEMENTARY FIGURE 24 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which participants must have answered ‘No’ at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 16,804$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = ‘Transgender’, ‘Non-binary’, and ‘Prefer to self-define’; Racially minoritised = ‘Arab’, ‘Asian’, ‘Black’, ‘Mixed race’, and ‘Other’.

Sensitivity analysis (3 nos): New onset suicidal and/or self-harm ideation during pandemic: OR (95% CI, p-value)

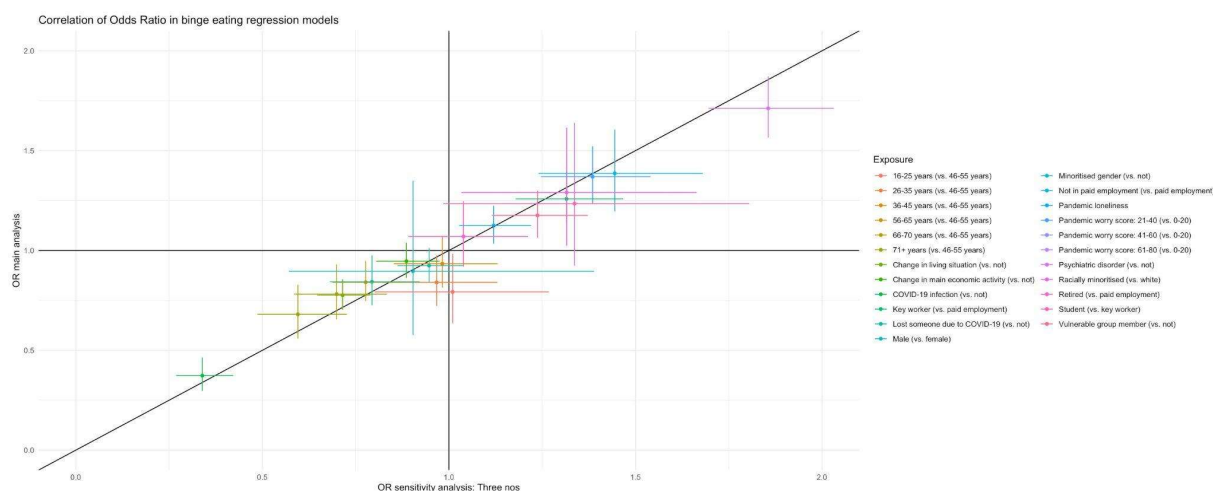


SUPPLEMENTARY FIGURE 25 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 13,082$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

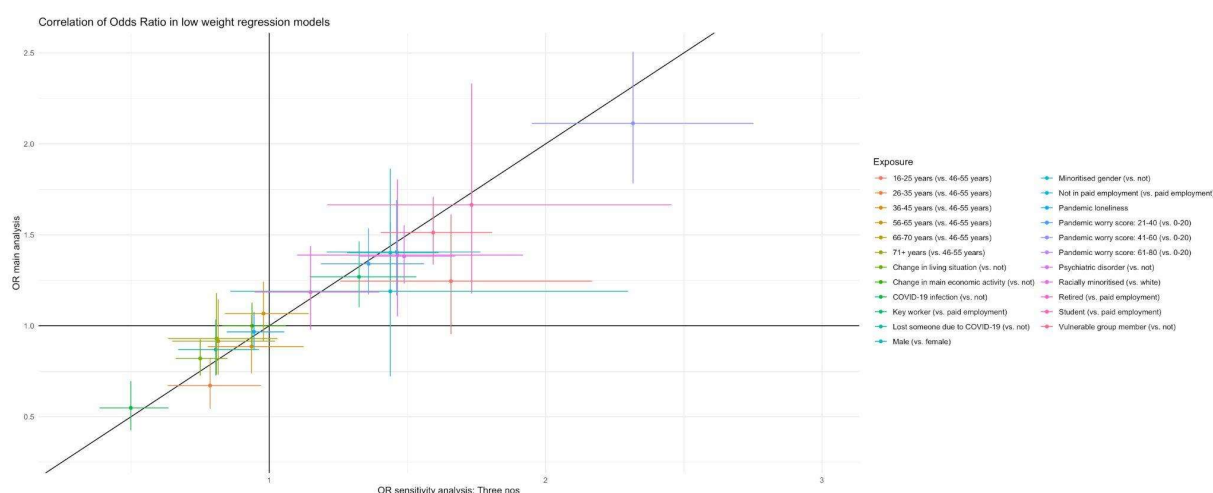
Sensitivity analysis (3 nos): New onset self-harm during pandemic: OR (95% CI, p-value)



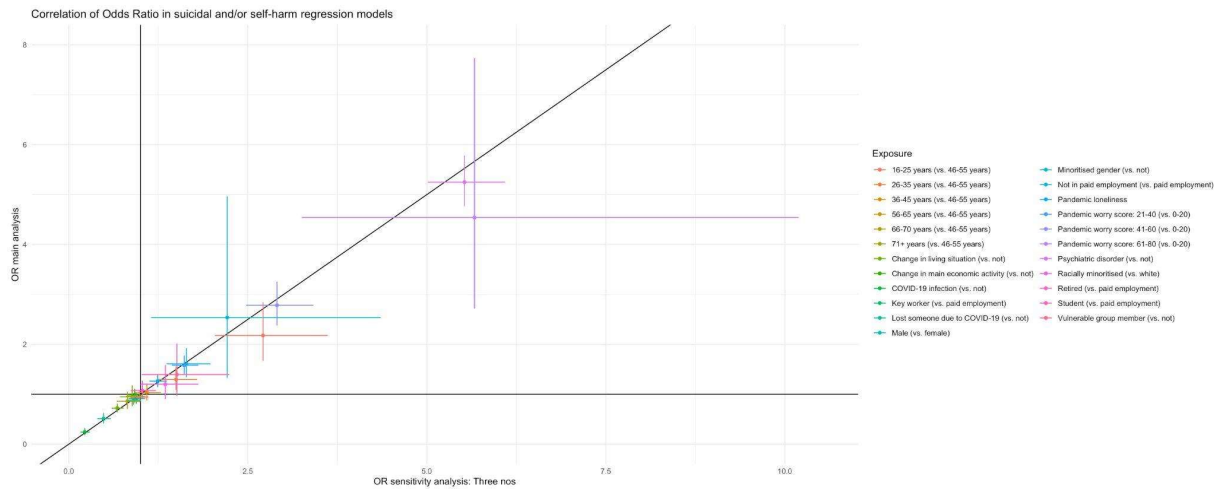
SUPPLEMENTARY FIGURE 26 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 18,758$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



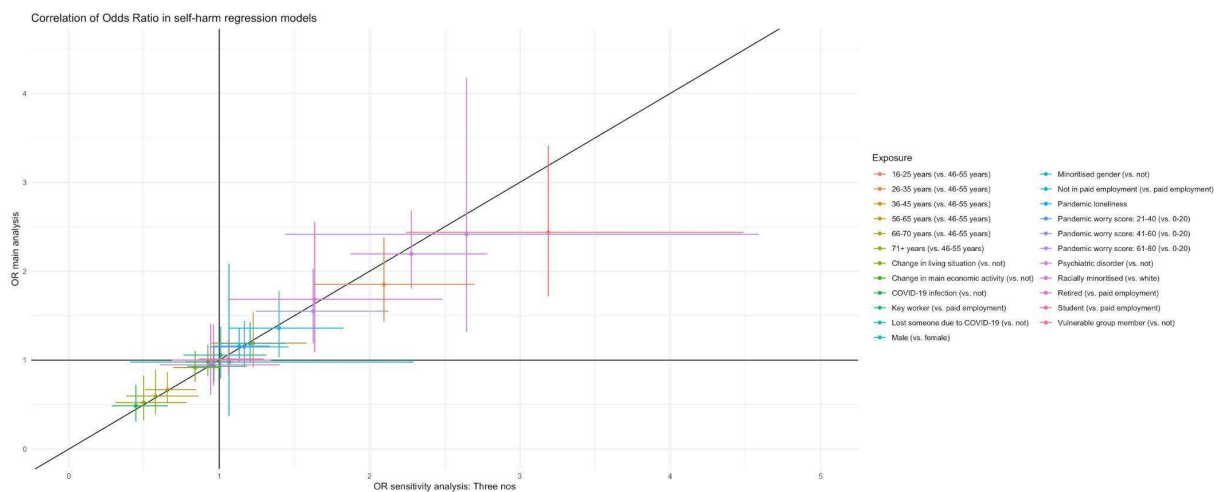
SUPPLEMENTARY FIGURE 27 Sensitivity analysis comparing the binge eating logistic regression results from the main analysis ($n = 18,172$) to a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 16,332$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



SUPPLEMENTARY FIGURE 28 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 16,804$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

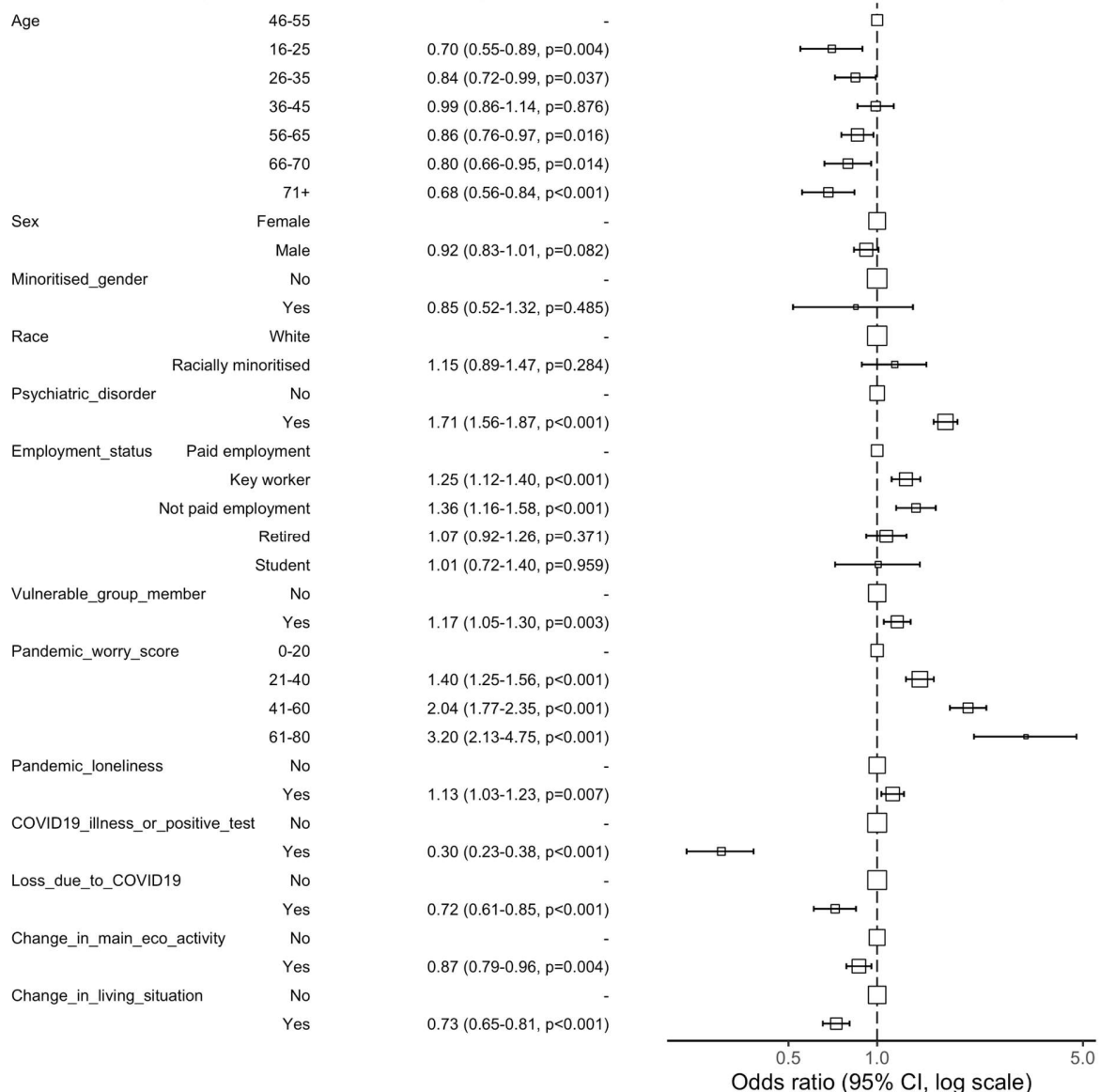


SUPPLEMENTARY FIGURE 29 Sensitivity analysis comparing the suicidal and/or self-harm logistic regression results from the main analysis ($n = 12,650$) to a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 13,082$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



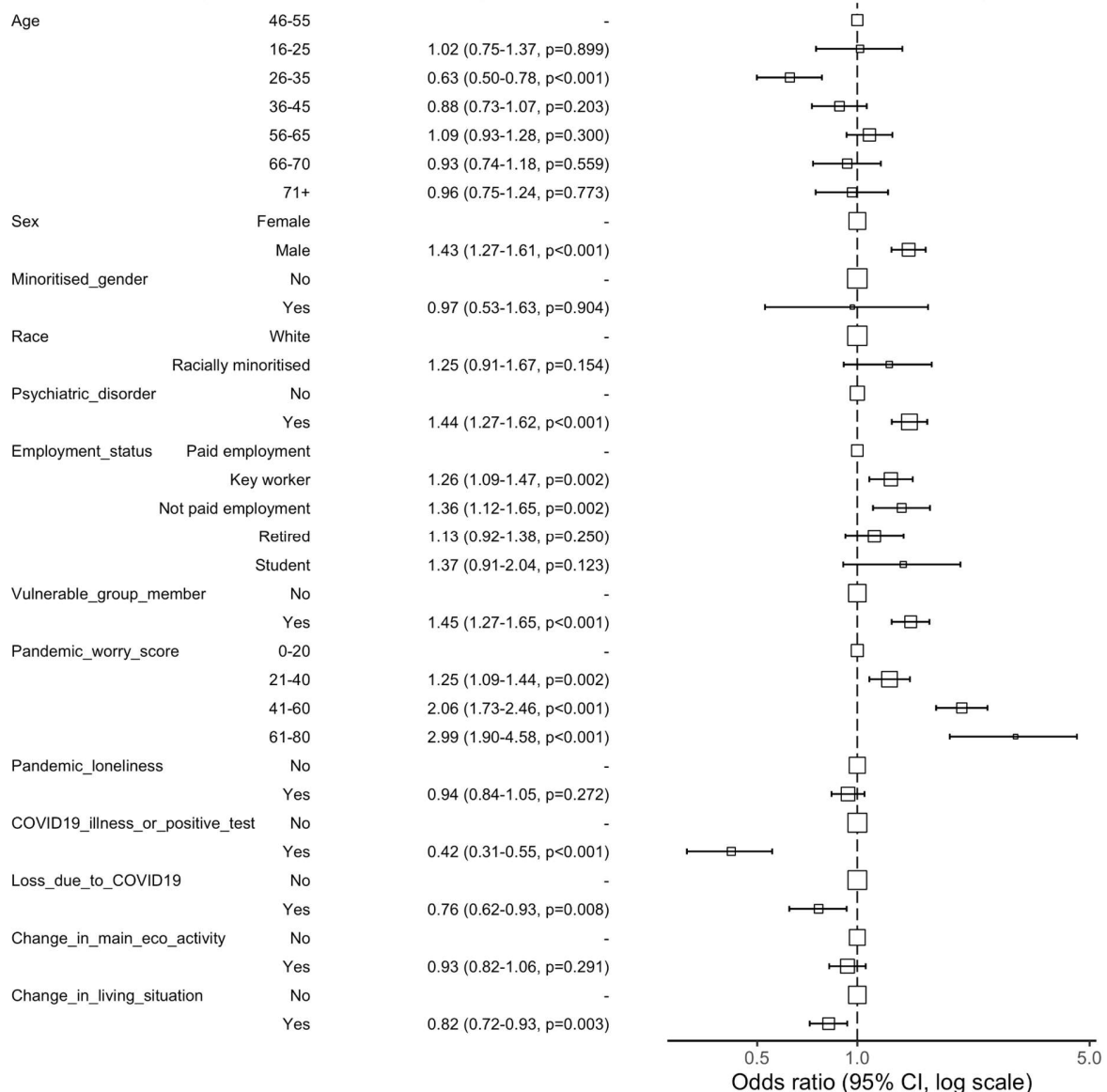
SUPPLEMENTARY FIGURE 30 Sensitivity analysis comparing the self-harm logistic regression results from the main analysis ($n = 20,266$) to a sensitivity analysis in which participants must have answered 'No' at least three times to be considered to not have experienced the outcome during the monitoring period ($n = 18,758$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (exposure before outcome): New onset binge eating during pandemic: OR (95% CI, p



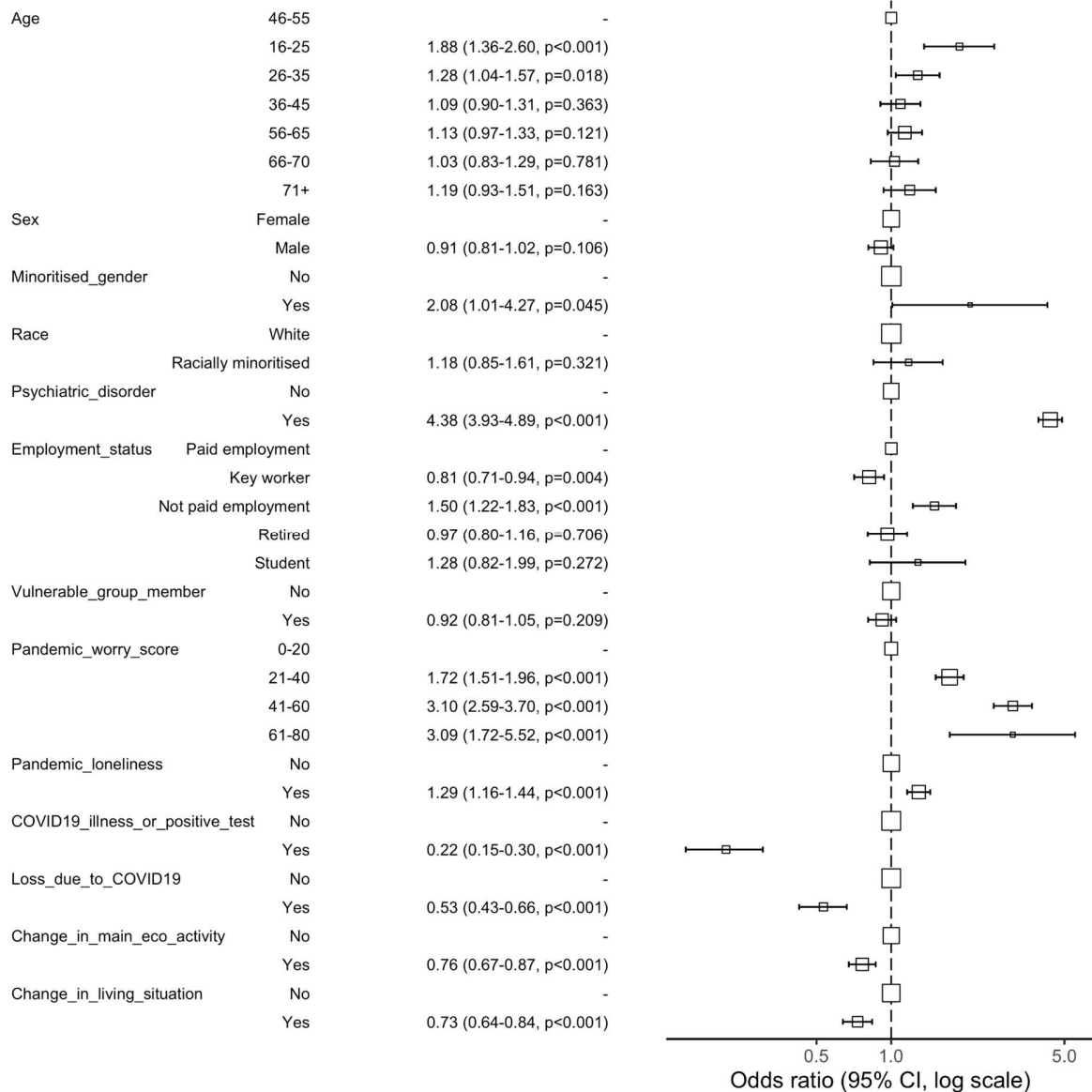
SUPPLEMENTARY FIGURE 31 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we only included instances in which the outcome was first reported in a phase after the exposure was first reported ($n = 17,861$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (exposure before outcome): New onset low weight during pandemic: OR (95% CI, p-v



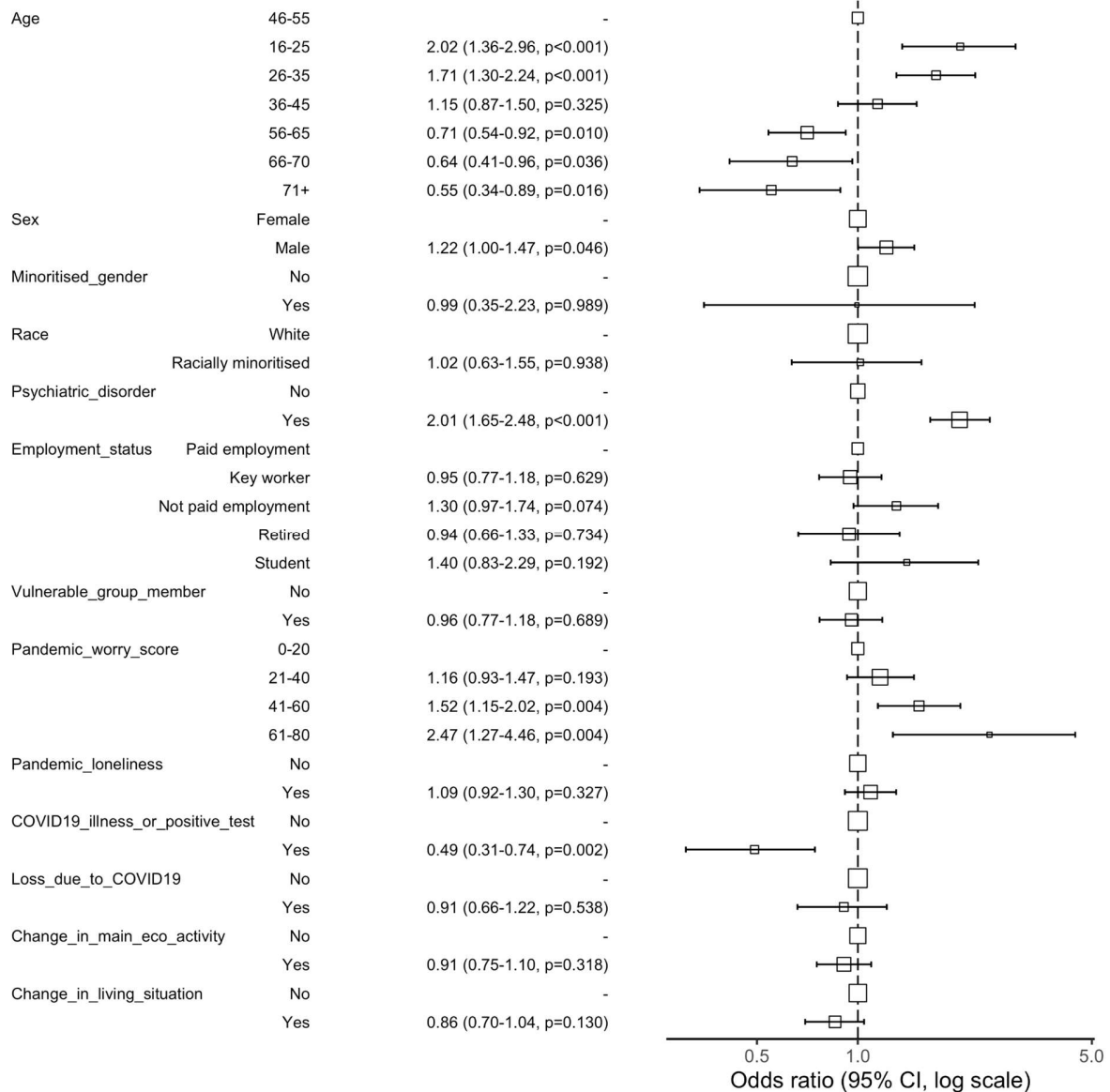
SUPPLEMENTARY FIGURE 32 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we only included instances in which the outcome was first reported in a phase after the exposure was first reported ($n = 18,971$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (exposure before outcome): New onset suicidal and/or self-harm ideation during pandemic: OR (95%

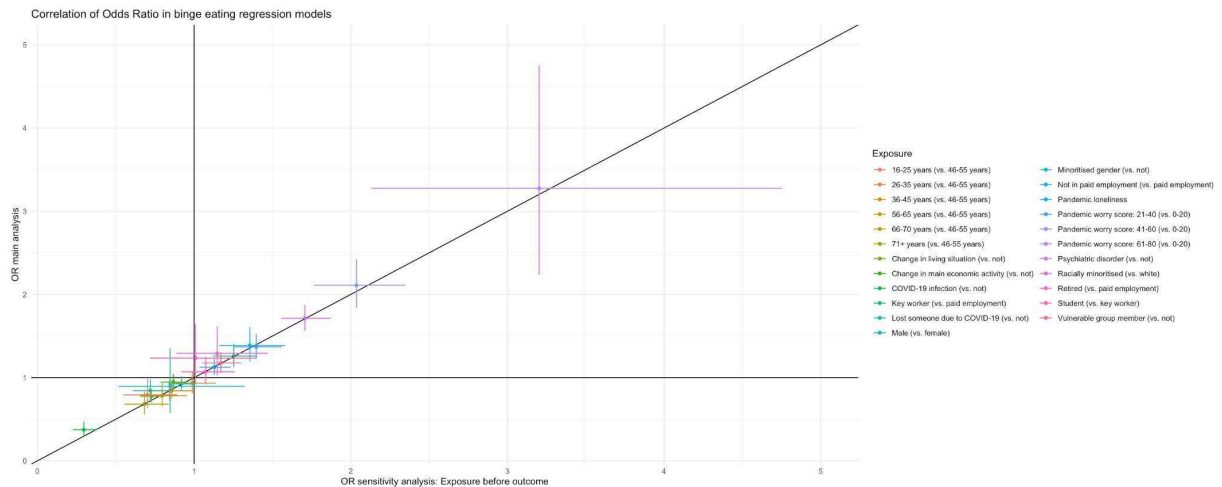


SUPPLEMENTARY FIGURE 33 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we only included instances in which the outcome was first reported in a phase after the exposure was first reported ($n = 13,002$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

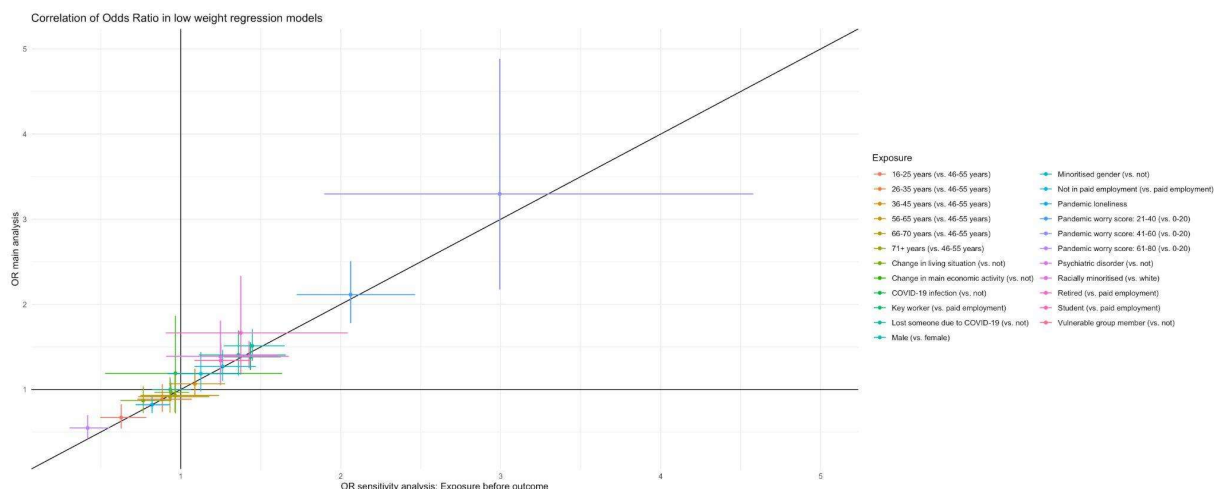
Sensitivity analysis (exposure before outcome): New onset self-harm during pandemic: OR (95% CI, p-value)



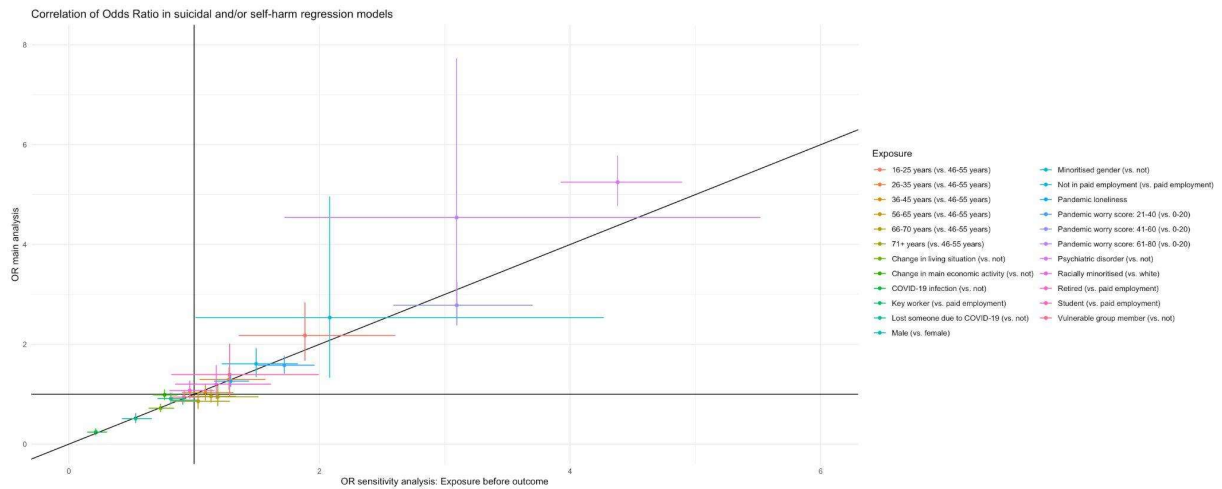
SUPPLEMENTARY FIGURE 34 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we only included instances in which the outcome was first reported in a phase after the exposure was first reported ($n = 19,054$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



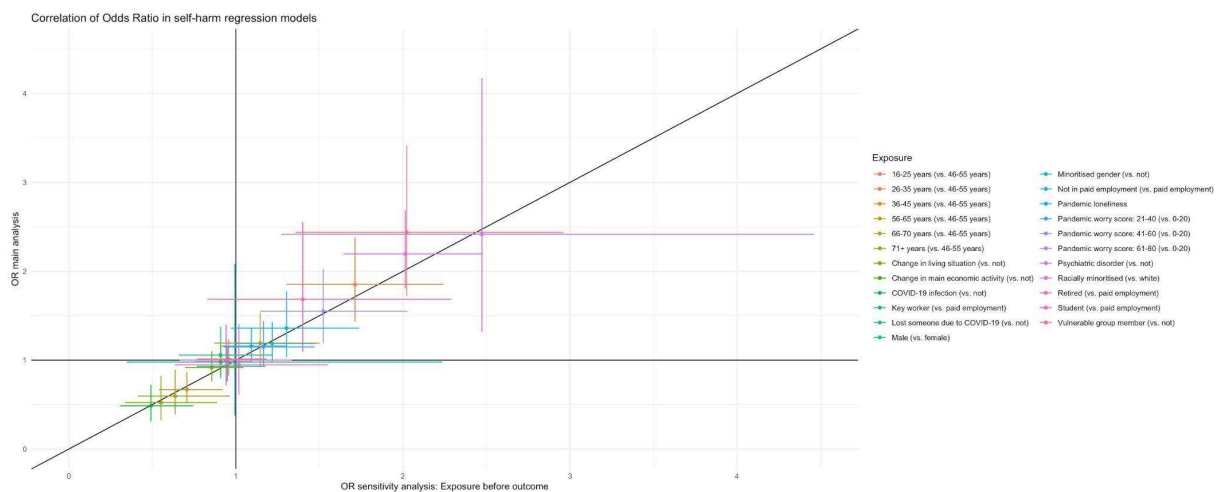
SUPPLEMENTARY FIGURE 35 Sensitivity analysis comparing the binge eating logistic regression results from the main analysis ($n = 18,172$) to a sensitivity analysis in which we only included instances when the outcome was first reported in a phase after the exposure was first reported ($n = 17,861$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = ‘Transgender’, ‘Non-binary’, and ‘Prefer to self-define’; Racially minoritised = ‘Arab’, ‘Asian’, ‘Black’, ‘Mixed race’, and ‘Other’.



SUPPLEMENTARY FIGURE 36 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which we only included instances when the outcome was first reported in a phase after the exposure was first reported ($n = 18,971$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = ‘Transgender’, ‘Non-binary’, and ‘Prefer to self-define’; Racially minoritised = ‘Arab’, ‘Asian’, ‘Black’, ‘Mixed race’, and ‘Other’.

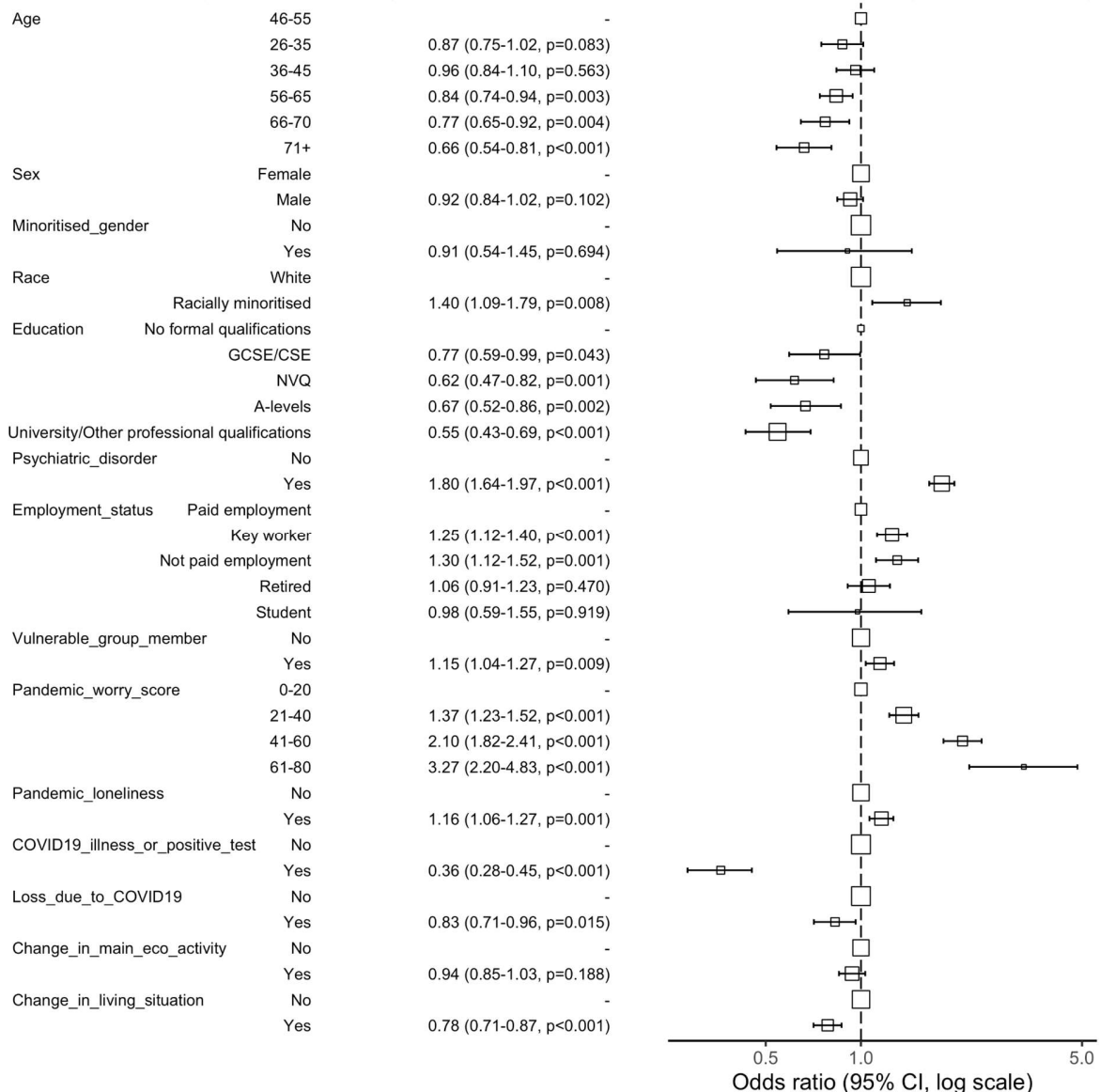


SUPPLEMENTARY FIGURE 37 Sensitivity analysis comparing the suicidal and/or self-harm logistic regression results from the main analysis ($n = 12,650$) to a sensitivity analysis in which we only included instances when the outcome was first reported in a phase after the exposure was first reported ($n = 13,002$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



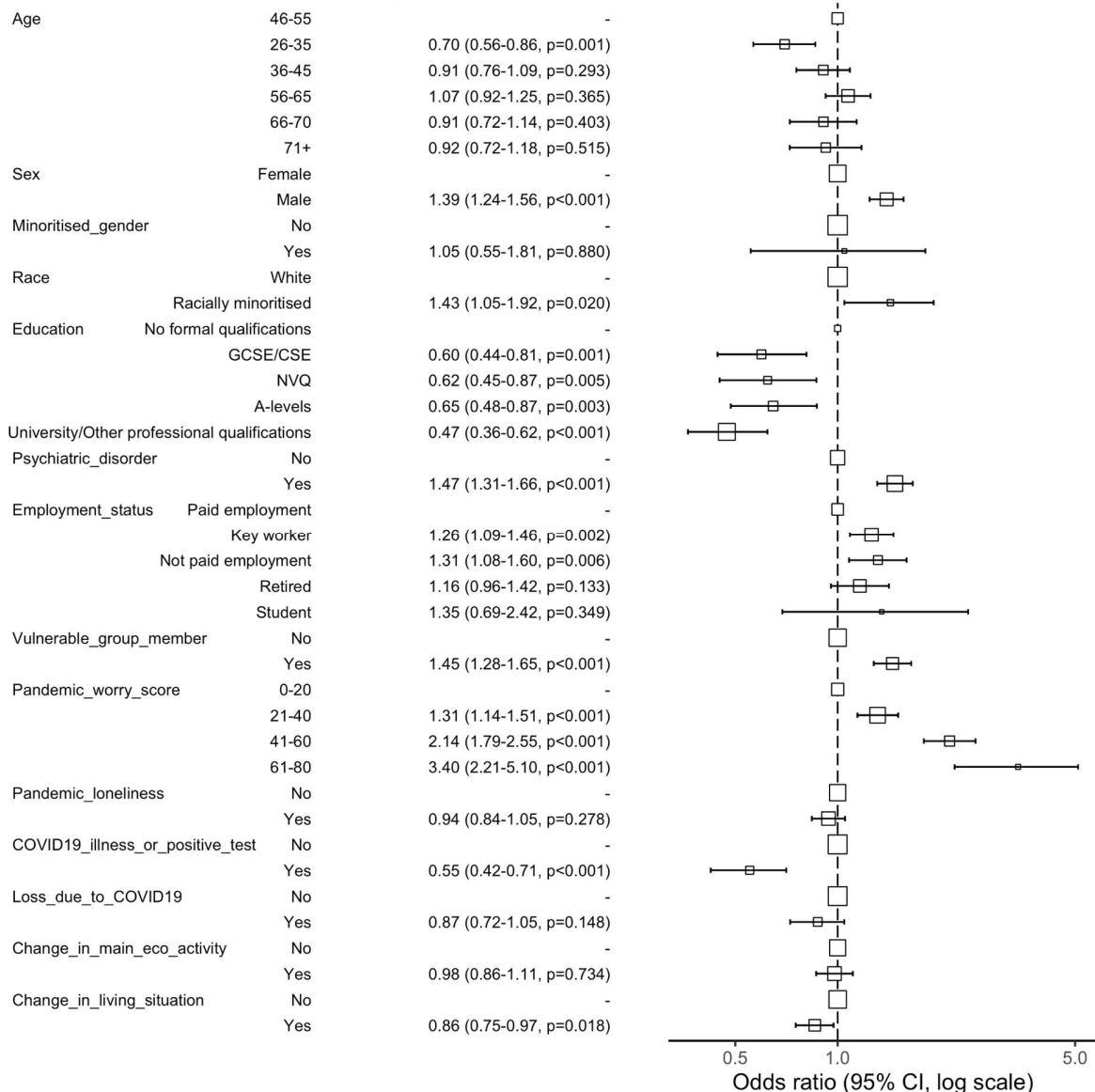
SUPPLEMENTARY FIGURE 38 Sensitivity analysis comparing the self-harm logistic regression results from the main analysis ($n = 20,266$) to a sensitivity analysis in which we only included instances when the outcome was first reported in a phase after the exposure was first reported ($n = 19,054$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (adding education): New onset binge eating during pandemic: OR (95% CI, p-value)



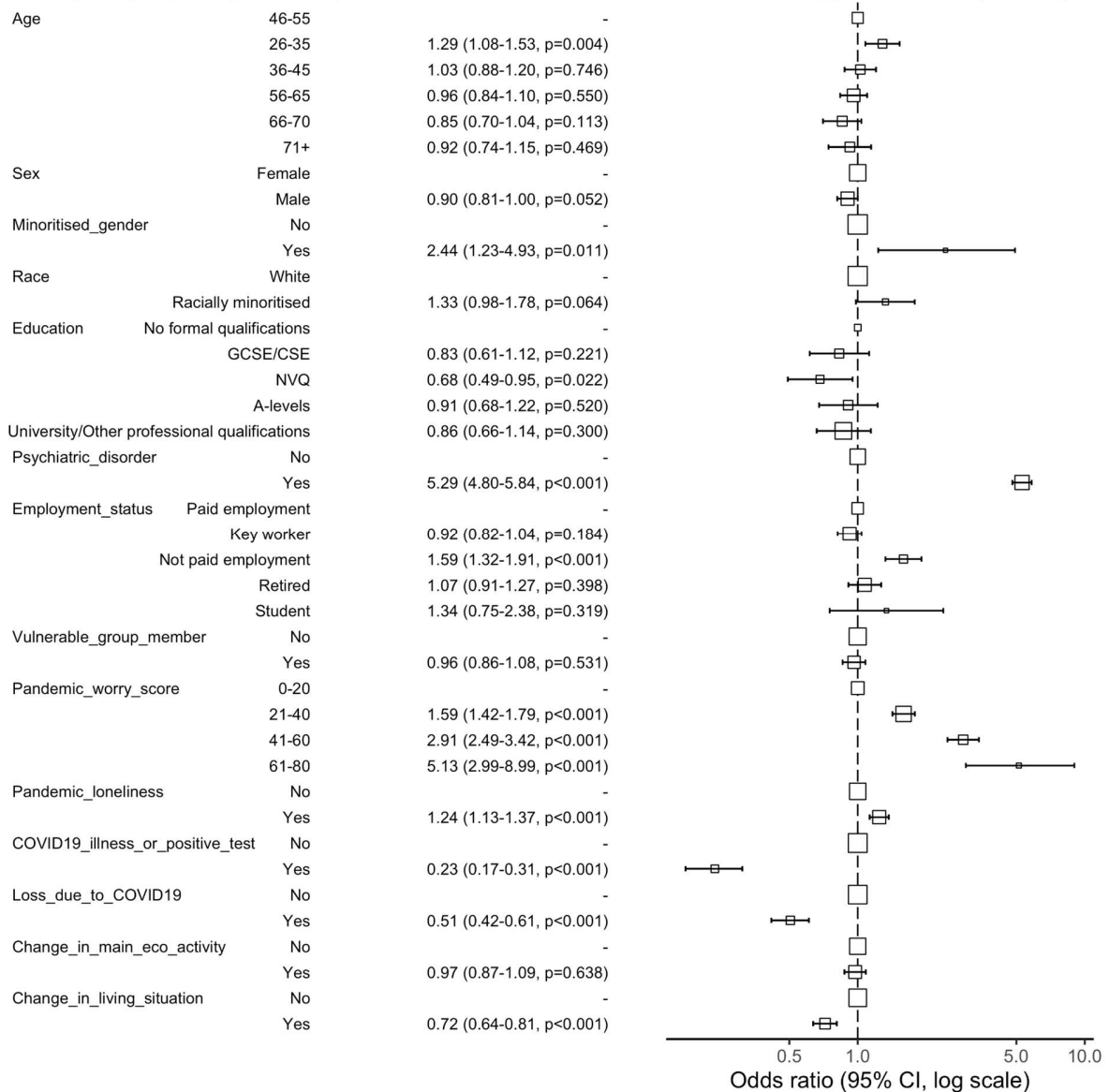
SUPPLEMENTARY FIGURE 39 Association between demographic and COVID-related variables and new onset of binge eating during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 17,284$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (adding education): New onset low weight during pandemic: OR (95% CI, p-value)



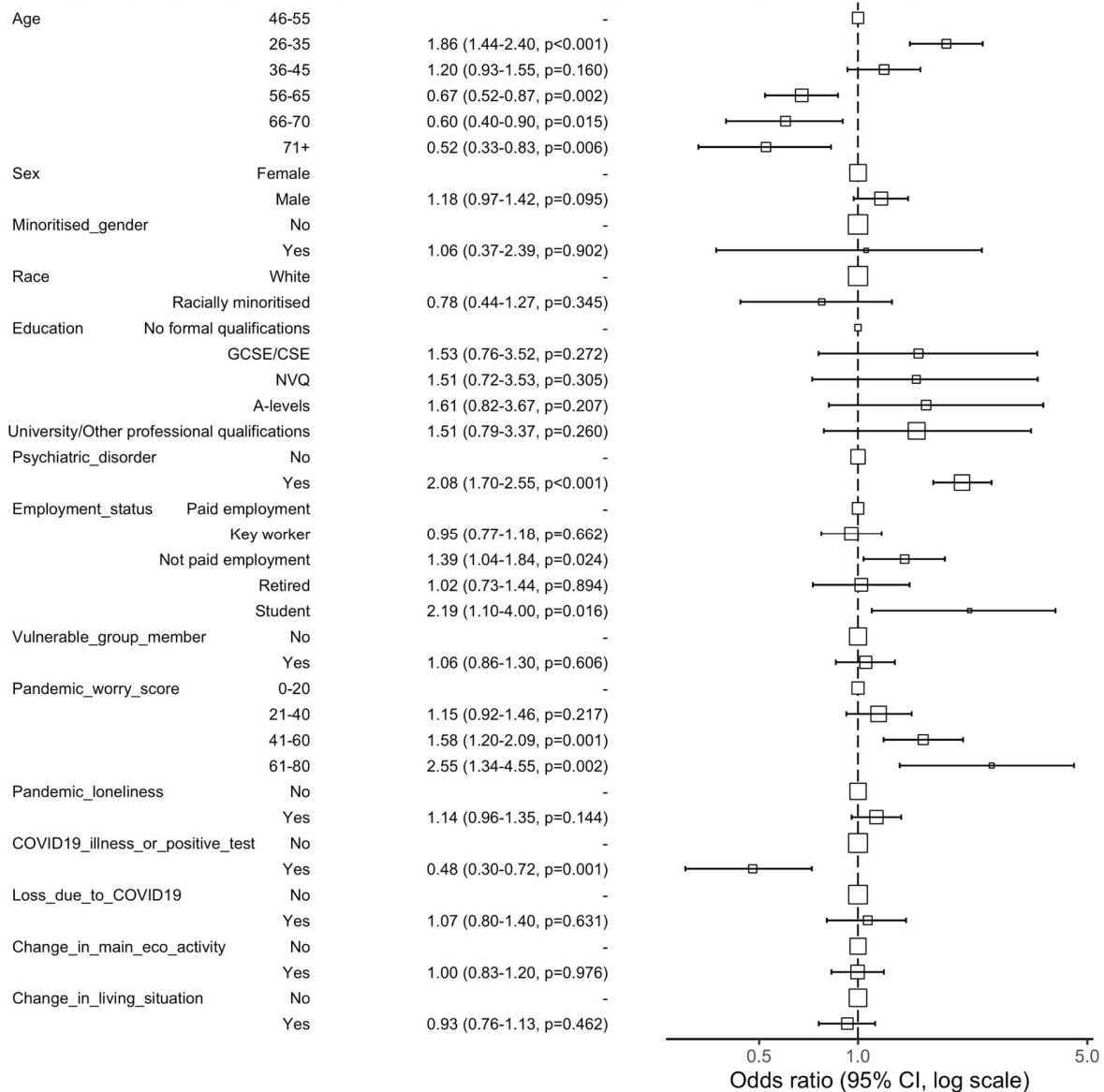
SUPPLEMENTARY FIGURE 40 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 18,199$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (adding education): New onset suicidal and/or self-harm ideation during pandemic: OR (95% CI, p-val

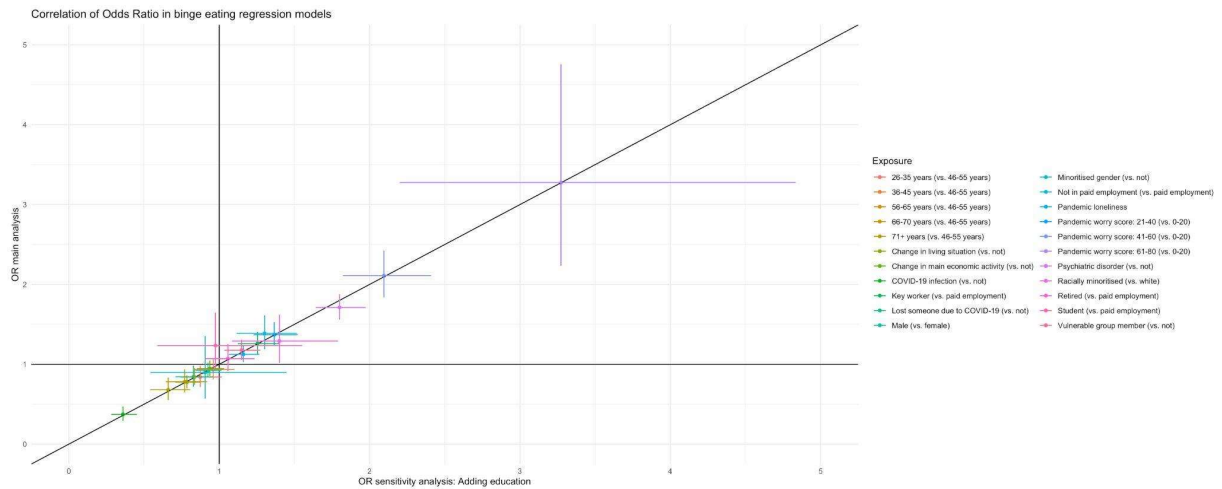


SUPPLEMENTARY FIGURE 41 Association between demographic and COVID-related variables and new onset of suicidal and/or self-harm ideation during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 12,878$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

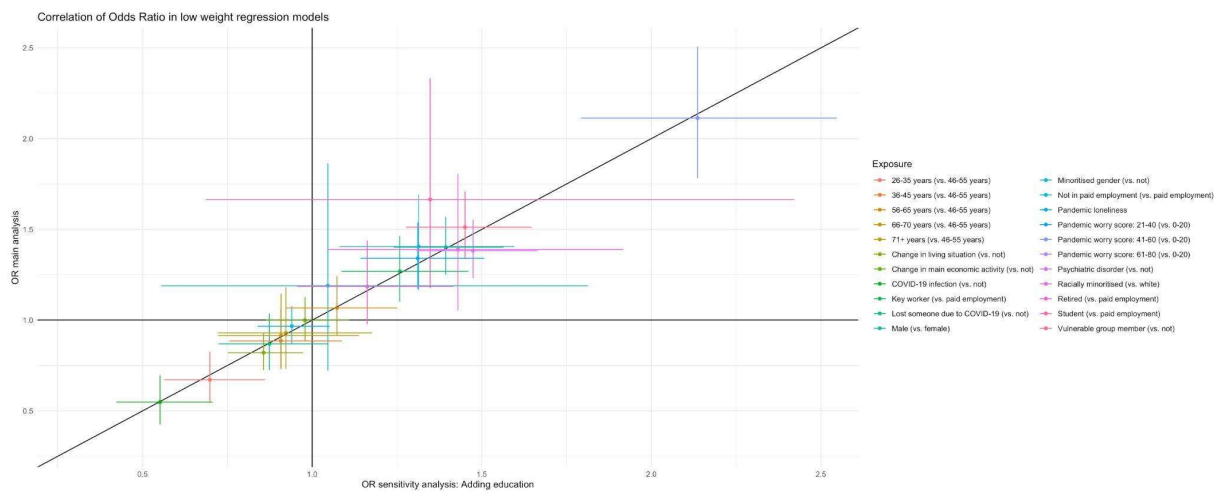
Sensitivity analysis (adding education): New onset self-harm during pandemic: OR (95% CI, p-value)



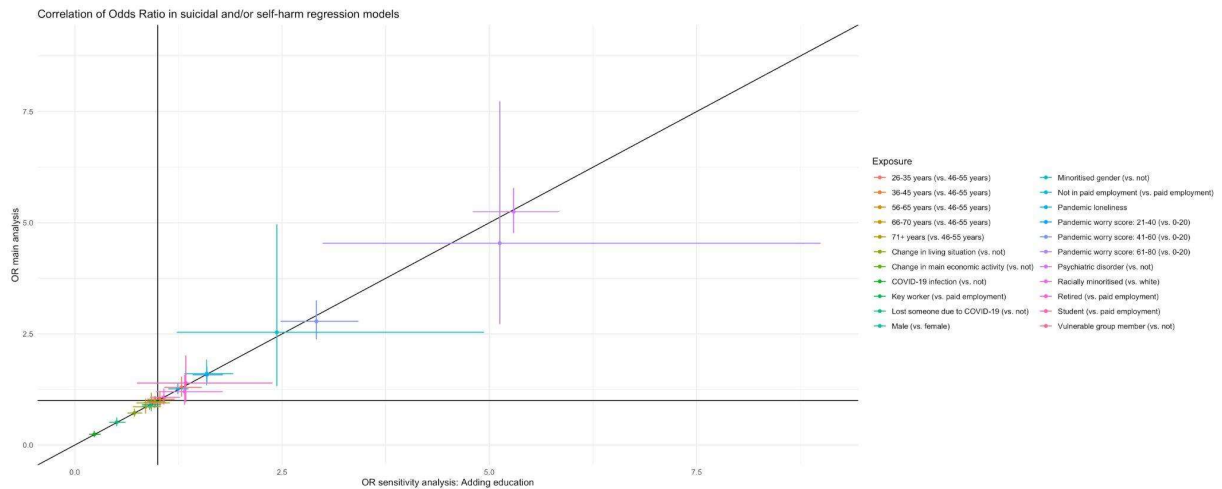
SUPPLEMENTARY FIGURE 42 Association between demographic and COVID-related variables and new onset of self-harm during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 18,552$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



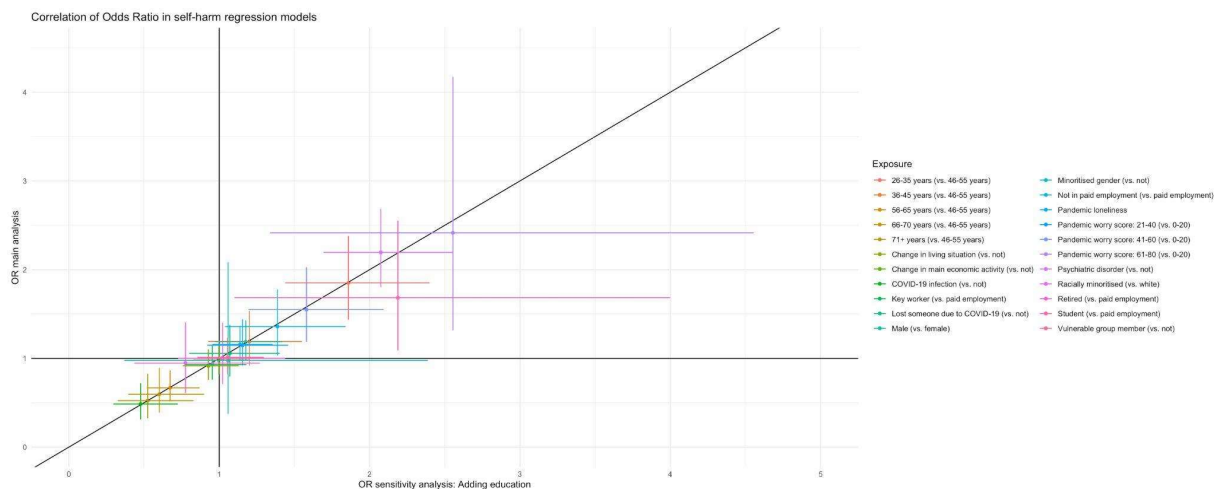
SUPPLEMENTARY FIGURE 43 Sensitivity analysis comparing the binge eating logistic regression results from the main analysis ($n = 18,172$) to a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 17,284$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



SUPPLEMENTARY FIGURE 44 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 18,199$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

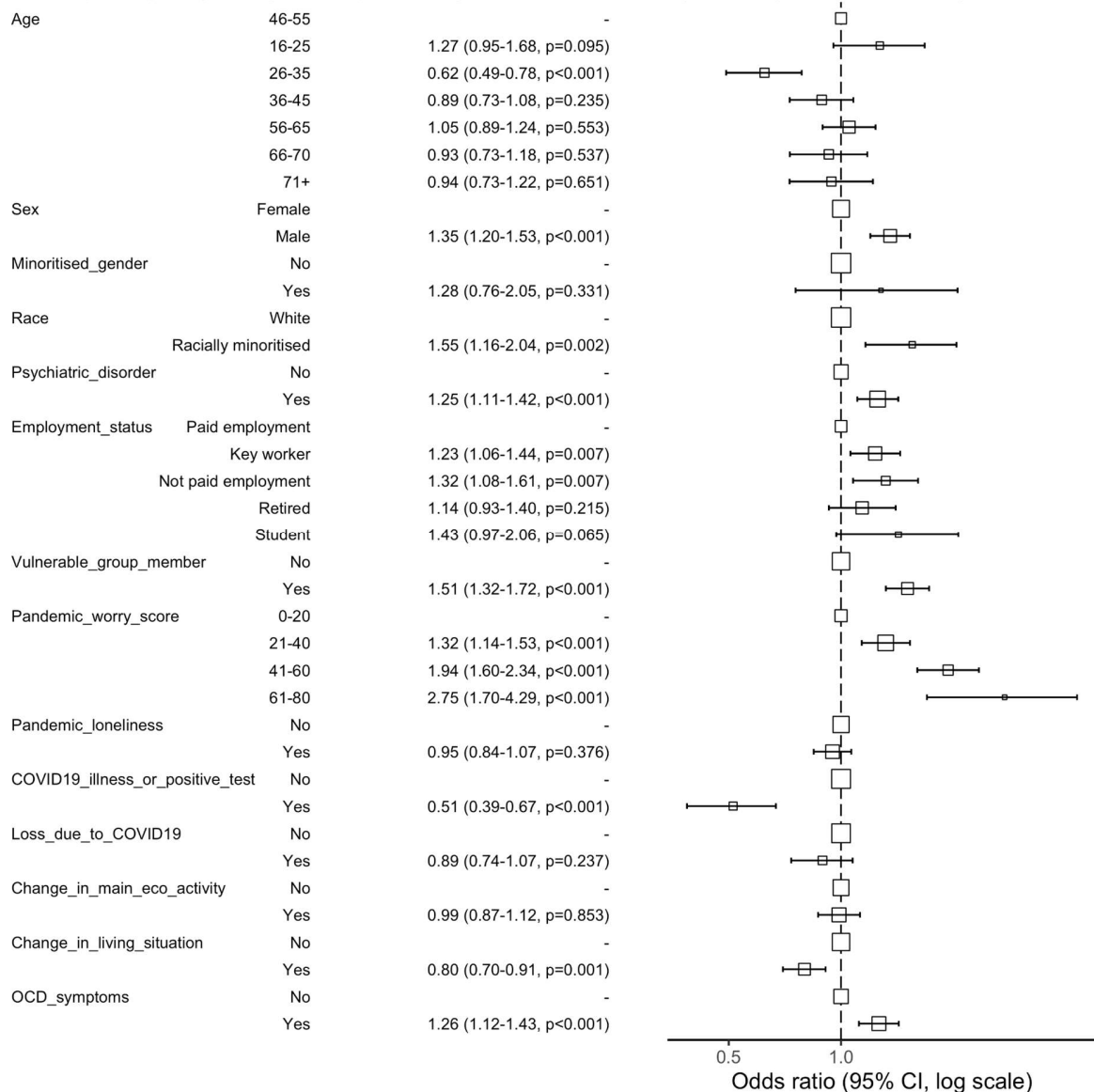


SUPPLEMENTARY FIGURE 45 Sensitivity analysis comparing the suicidal and/or self-harm logistic regression results from the main analysis ($n = 12,650$) to a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 12,878$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

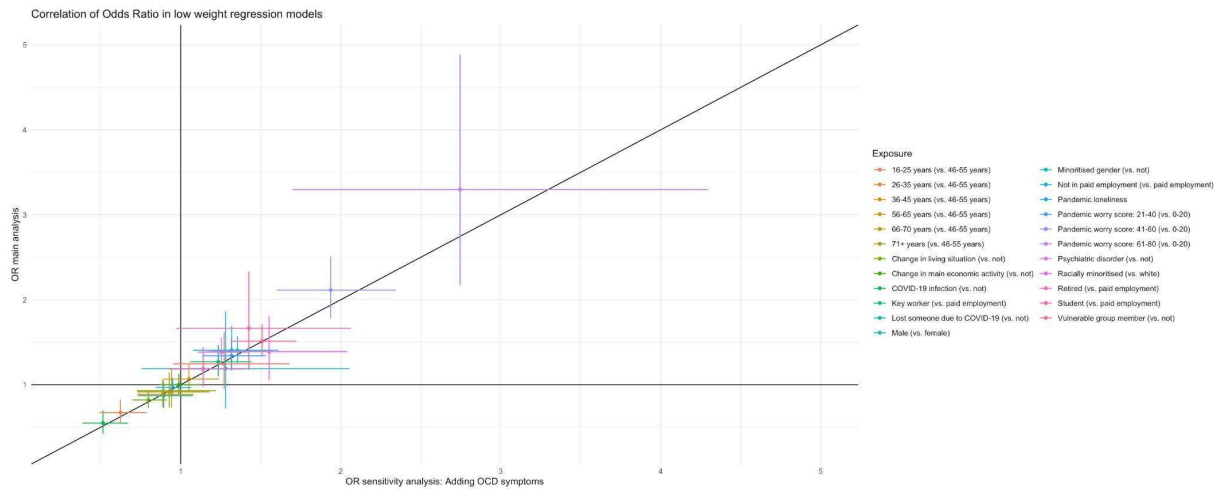


SUPPLEMENTARY FIGURE 46 Sensitivity analysis comparing the self-harm logistic regression results from the main analysis ($n = 20,266$) to a sensitivity analysis in which we excluded participants aged 16-25 and included highest education as an exposure ($n = 18,552$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

Sensitivity analysis (adding OCD symptoms): New onset low weight during pandemic: OR (95% CI, p-val



SUPPLEMENTARY FIGURE 47 Association between demographic and COVID-related variables and new onset of low weight during the pandemic. Results are derived from multiple logistic regression models in a sensitivity analysis in which we included OCD symptoms as an exposure ($n = 16,345$). Note. The size of the squares reflects the number of participants in each group; Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.



SUPPLEMENTARY FIGURE 48 Sensitivity analysis comparing the low weight logistic regression results from the main analysis ($n = 19,148$) to a sensitivity analysis in which we included OCD symptoms as an exposure ($n = 16,345$). The vertical lines are the confidence intervals from the main analysis. The horizontal lines are the confidence intervals from the sensitivity analysis. Note. Minoritised gender = 'Transgender', 'Non-binary', and 'Prefer to self-define'; Racially minoritised = 'Arab', 'Asian', 'Black', 'Mixed race', and 'Other'.

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