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The mental health and experiences of discrimination of LGBTQ+ people during the COVID-19 pandemic: Findings from the Queerantime Study

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Abstract

Objectives: To assess the mental health and experiences of discrimination amongst a sample of Lesbian, Gay, Bisexual, Transgender, Queer people (LGBTQ) during the COVID-19 pandemic.

Design: Data were collected through a cross-sectional survey targeted towards LGBTQ+ people. Data on mental health measures, experiences of discrimination and a number of other pandemic-related experiences were collected. Bivariate analyses were undertaken and regression models constructed; models were adjusted for a range of demographic and socioeconomic variables.

Setting: A web-based survey was used to collect data between the end of April and mid-July 2020.

Participants: A total of 398 LGBTQ+ respondents aged 18 and over.

Main outcome measures: We assessed mental health with the 4-item Perceived Stress Scale (PSS-4), and with the 10-item Center for Epidemiological Studies Depression scale (CES-D-10). We asked respondents about discriminatory experiences because of their LGBTQ+ identity during the coronavirus pandemic.

Results: Perceived stress scores among our LGBTQ+ sample were high (Mean: 7.67; Standard Deviation: 3.22). Based on a score of ten or over on the CES-D-10, the majority of participants had high levels of depressive symptoms (72%). Around one-in-six respondents reported some form of discrimination since the start of the pandemic because they were LGBTQ+ (16.7%). The average score for perceived stress increased by 1.44 points (95% Confidence Interval (CI): 0.517-2.354) for respondents who had experienced discrimination versus those who had not. Similarly, the odds of exhibiting significant depressive symptomatology increased three-fold among those who had experienced discrimination compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052).

Conclusions: The coronavirus pandemic has had a detrimental impact on the mental health of the LGBTQ+ community. These associations were partially explained by experiences of discrimination which had a large, consistent and pernicious impact on stress and mental health.

Keywords: COVID-19; LGBTQ+; mental health; stress; discrimination.

Article summary – strengths and limitations of this study

- This study provides an insight into the impacts of the coronavirus pandemic on LGBTQ+ mental health. Using validated tools, the study finds that the pandemic triggered very high levels of stress and depressive symptoms among LGBTQ+ people.
- An online convenience sample was deemed appropriate due to the absence of robust data on LGBTQ+ people from large surveys that could help to determine the characteristics of a representative sample of LGBTQ+ people. An online approach was particularly suitable for those respondents who may have been sheltering or shielding in households where their LGBTQ+ status was unknown to other members of the household.
- However, an online convenience sample can introduce potential issues around sample selection and the possibility that those living in stressful situations or with depressive symptoms were more likely to self-select into the survey.
- Due to relatively small sample sizes, we have not been able to fully examine the diversity of the LGBTQ+ community, and fully examine how experiences vary according to social locations such as ethnicity, age, and gender identity.
- The present study advances the argument for continued exploration of LGBTQ+ mental health through identifying not only high levels of mental health issues during the pandemic, but also demonstrating that sexuality- and gender-based discrimination is an important mediator.

1 Introduction

2 The coronavirus pandemic has exposed and magnified existent societal and health inequities
3 operating across multiple and intersecting systems of oppression. Given documented stark
4 health and socioeconomic inequalities across social locations related to sexuality, and gender
5 expression and identity,¹ the coronavirus disease (COVID-19) and subsequent social and
6 economic implications could be expected to disproportionately impact on Lesbian, Gay,
7 Bisexual, Transgender, and Queer (LGBTQ+, the “plus” including those who don’t identify
8 with any such label) people. To date there is a dearth of information on whether this is the
9 case.

10
11 Higher levels of pre-existing health conditions compared to cisgender and heterosexual
12 populations, may place the LGBTQ+ community at additional risk of adverse prognosis. This
13 includes long-term chronic illness, and higher rates of smoking and asthma among LGBTQ+
14 people;²⁻⁵ higher rates of obesity, and alcohol consumption among lesbian, bisexual, and
15 queer women;⁵⁻⁷ and increased likelihood of being immunocompromised (e.g. HIV+ with a
16 low CD4 cell count or with untreated HIV) among gay men and transgender people.⁸ In
17 addition, the impacts of social distancing and lockdown may be felt acutely by LGBTQ+
18 people, who even before the pandemic started, were at higher risk of poorer mental health as
19 indicated by higher levels of suicide attempts and suicidal ideation, and lower levels of
20 mental wellbeing.^{9 10}

21
22 Theoretical frameworks including the Minority Stress Model suggest that stark health
23 inequalities are the result of distal and proximal stressors caused by living within a
24 homophobic, heterosexist, transphobic culture, results in cumulative experiences of
25 discrimination, harassment, victimization, expectations of rejection, and internalized

1 transphobia and homophobia.^{11 12} These experiences have been extensively documented
2 across several studies, where high prevalence of experiences of stigma and discrimination has
3 been reported among the LGBTQ+ community.^{13 14}

4
5 Within the heterogeneous LGBTQ+ umbrella term, individual groups may be positioned at a
6 distinct disadvantage. Transgender and gender-diverse (TGGD) individuals have a gender
7 identity or expression that differs from the culturally-bound gender associated with one's
8 assigned birth.¹⁵ TGGD people are known to experience higher rates of adverse mental
9 health compared to cisgender individuals (people whose gender identity or expression
10 matches their sex assigned at birth), particularly anxiety, depression, and suicidality.^{3 4 16}

11
12 In the context of the coronavirus pandemic where existent inequalities are being exacerbated,
13 it is paramount to document whether, and how, inequalities between the LGBTQ+
14 community and heterosexual, cisgender individuals are being further amplified. The present
15 study aims to address this need through analysing data from the Queerantime Study (a
16 portmanteau Queer and Quarantine), a web-based survey that assesses how LGBTQ+ people
17 are experiencing the coronavirus pandemic.

18 19 **Methods**

20 Data collection was conducted via a cross-sectional, web-based anonymous survey that began
21 on 27 April 2020). Data for the present analyses were collected until 13 July 2020. The target
22 sample included respondents aged 18 and over, and who self-identify as lesbian, gay,
23 bisexual, transgender, queer, as having another minority sexual orientation, gender non-
24 binary, or as intersex. Cisgender respondents who self-identify as heterosexual were not
25 excluded from the survey, although recruitment and survey design were tailored towards the

1
2
3 1 LGBTQ+ community. The Queerantime survey asks respondents about their
4
5 2 sociodemographic characteristics, their physical and mental health, health behaviours, and
6
7 3 experiences and anxieties relating to the pandemic and their identity.
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10 4

11 12 5 **Patient and Public Involvement**

13
14 6 Expert input broadened the focus to consider how respondents had experienced changes in
15
16 7 support from LGBTQ+ service providers and organisations; this input also helped to shape
17
18 8 the measures around gender identity. Community organisations also helped in the
19
20 9 dissemination of the study through social media and inclusion of the study within newsletters.
21
22 10 However, no further public involvement was sought in the design or analysis of the survey.
23
24
25
26 11

27 28 12 **Outcome variables**

29
30 13 In this analysis we focus on three outcomes: depression, stress, and experiences of
31
32 14 discrimination. We assessed depression with the 10-item Center for Epidemiological Studies
33
34 15 Depression Scale (CES-D-10), which asks respondents to consider how much in the past
35
36 16 week they have experienced feelings of loneliness, happiness, and fear.¹⁷ In total the scale
37
38 17 includes three items on depressed affect, five items on somatic symptoms, and two on
39
40 18 positive affect.¹⁸ Scores range between 0 and 30, with thresholds used to denote ‘depressive
41
42 19 symptoms’ based on a score of ten or over¹⁷. In the present study we examine the CES-D-10
43
44 20 both as continuous (Cronbach’s $\alpha=0.87$), and as a binary measure, with a cut-off of 10 or
45
46 21 more indicating significant depressive symptomology.
47
48 22 We measured stress with the 4-item Perceived Stress Scale (PSS-4), which assesses the extent
49
50 23 to which situations in life are viewed as stressful.¹⁹ The scale asks respondents about their
51
52 24 ability to control important things in life, confidence in handling personal problems, the
53
54 25 extent to which they felt things were going their way, and whether difficulties were piling up
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1 so high they were becoming insurmountable, using the past month as a frame of reference.
2 Scores range between 0 and 15, and have good levels of internal consistency in our analytical
3 sample (Cronbach's $\alpha=0.83$).
4 We measured experiences of discrimination with a set of questions that asked respondents
5 whether, since the start of the coronavirus pandemic, they had experienced verbal
6 harassment, physical harassment, sexual harassment, threats of violence, exclusion from
7 events/activities, involuntary disclosure of LGBTQ+ identity, or other forms of inappropriate
8 treatment because they were LGBTQ+ or were perceived as being LGBTQ+. Individual
9 measures were combined into one summary variable of 'any discrimination.'

10

11 **Sexual orientation and gender identity or expression**

12 Gender identity was assessed using the recommended two-step method²⁰ with two items: (1)
13 assigned sex at birth and (2) current gender identity. The two items were cross-tabulated to
14 categorise participants as either TGGD or cisgender. Sexual orientation was captured with a
15 question that asked participants to select their sexual orientation from the following
16 categories: Bisexual; Gay/Lesbian; Heterosexual/Straight; Don't know; Prefer not to say; and
17 an Other, free-text category.

18

19 We examine sexual orientation, and gender identity or expression as different constructs, and
20 also combine both into a separate variable that examines the intersection of sexual orientation
21 and gender identity or expression using five categories: (i) cisgender female lesbian/gay; (2)
22 cisgender female other non-heterosexual (including bisexual, other, don't know, and prefer
23 not to say); (3) transgender and gender diverse; (4) cisgender male gay; (5) cisgender male
24 other non-heterosexual (including bisexual, other, don't know, and prefer not to say).

25

1 **Covariates**

2 We adjusted for variables thought to confound the association between our exposure and
3 outcome variables. This included age, relationship status, ethnicity, and country of residence.
4 We also controlled for socioeconomic status with a variable that asked respondents about
5 their subjective social status (modelled on a validated approach ²¹), and how this had changed
6 since the start of the pandemic, with categories reflecting no change, positive change, and
7 negative change.

8 **Analytical plan**

9 The analysis consisted of a complete case analysis of respondents. Summary statistics were
10 calculated for baseline characteristics and associations between exposure variables and
11 outcomes were tested in unadjusted analyses using the χ^2 test of association and ANOVA as
12 appropriate. Ordinary Least Squares regression models were constructed for continuous
13 models of stress and depression, and binary logistic regression models were constructed for
14 high depressive symptomology. For models where depression or stress are the outcomes of
15 interest, we used the measure of discrimination as the main exposure variable. For models
16 where discrimination is the outcome of interest we only adjusted for sexual orientation,
17 gender identity or expression, age, ethnicity, and location. Additional analysis examining
18 when in the pandemic harassment and discrimination occurred is also included to
19 contextualise the discussion. Adjusted and unadjusted models are presented. We conducted
20 all analyses in Stata 14. ²²

21 **Results**

22
23 Between April 27th and July 13th, a total of 426 responses were received. Of these 24 were
24 excluded because they did not provide their age, and 4 were excluded because they were aged
25

1 under 18. Of the remaining 398, we were able to calculate PSS-4 and CES-D-10 scores for
2 325 and 324 respondents respectively. Once we had accounted for missingness on other
3 covariates, the analytical sample consisted of 310 respondents for models of mental health,
4 excluding one further cisgender heterosexual respondent.

5
6 *TABLE 1 HERE*

7
8 The analytical sample broadly mirrored the sociodemographic characteristics of the recent
9 UK government National LGBT Survey.²³ The distribution of respondents by sexual
10 orientation was very similar, albeit with a higher share of respondents who identified as
11 Queer in the Queerantime survey (8% vs approximately 1%). The proportion of respondents
12 aged 18-24 was lower at 15.1% (compared with approximately 37.4%), with higher
13 proportions at older age groups in line with the UK population as a whole. Almost a quarter
14 of the sample (23.5%) were categorised as TGGD, suggesting greater representation than in
15 the UK National LGBT Survey sample where the proportion of TGGD respondents stood at
16 approximately 15%.²³
17 Descriptively, the results suggested that the sample had high levels of stress and depression.
18 The mean score for PSS-4 (Mean(M): 7.67; Standard Deviation (SD): 3.22) was higher than
19 that observed in UK community samples in previous studies²⁴ and selected studies of sexual
20 minorities conducted elsewhere.²⁵ Using the recommended threshold of 10 or more to
21 identify depressive symptomatology, we observed high levels of respondents falling into this
22 category (71.9%), a higher proportion than observed among other populations known to be
23 susceptible to depression such as people living with HIV/AIDS.²⁶ Cis-female respondents
24 who identify as gay or lesbian had the lowest scores for perceived stress or depressive

1 symptoms (see Table 1); conversely transgender and gender diverse individuals had the
2 highest scores (83.6%).

3
4 One-in-six respondents reported some form of harassment since the start of the pandemic
5 because they were LGBTQ+ (16.7%); the most common forms being verbal harassment
6 including insults or other hurtful comments (8.7%), exclusion from events or activities
7 (5.6%), and involuntary disclosure of LGBTQ+ identity (3.5%). Stress was markedly higher
8 for those who had experienced discrimination (PSS-4 M: 9.44 SD: 2.99) compared to those
9 who had not (PSS-4 M: 7.35 SD: 3.16). Respondents who had experienced discrimination
10 also had higher depression symptomology scores (CES-D-10 M: 17.87 SD: 6.21) compared
11 to those who had not (CES-D-10 M: 13.43 SD: 6.97).

12
13 *TABLE 2 HERE*

14
15 We examined the relationship between gender identity and sexual orientation and
16 discrimination in logistic regression models (see Table 2). Based on the association observed
17 in Table 1, we used TGGD as the reference category and explored whether the higher risk of
18 TGGD to experience discrimination remained after controlling for basic sociodemographic
19 covariates. The results from adjusted models showed that the odds of experiencing
20 discrimination were lower for all other groups, and significantly lower in the case of
21 cisgender gay males (OR: 0.237, 95% Confidence Interval (CI):0.091-0.617) and cisgender
22 females who identified with a sexual minority orientation other than gay/lesbian (OR: 0.361,
23 CI: 0.141-0.921). Within the sample, the results were suggestive of a u-shaped trend in terms
24 of age, with the youngest and the oldest LGBTQ+ respondents in the sample being at greatest

1 risk of experiencing discrimination, although differences by age were generally not
2 statistically significant.

3
4 Experiences of discrimination were clear predictors of poorer mental health. The average
5 score for perceived stress increased by 1.44 points (CI: 0.517-2.354) for those who had
6 experienced discrimination, compared to those who had not. Similarly, the odds of exhibiting
7 significant depressive symptomology (CES-D-10 scores of 10 or more) increased three-fold
8 among those who had experienced discrimination based on their gender or sexuality
9 compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052). These marked
10 associations remained after adjusting for potential confounders (see Models 1 to 4 in Table
11 3).

12
13 *TABLE 3 HERE*

14
15 Cisgender female lesbian or gay respondents had lower stress levels than other LGBTQ+
16 groups. TGGD respondents and non-heterosexual cisgender males who identified as gay had
17 among the highest average stress scores in adjusted models. Although a similar trend was
18 observed in the odds of experiencing depressive symptomatology, the evidence was
19 ultimately inconclusive. Further exploration of the CES-D-10 as a continuous measure (see
20 appendix table) shows that TGGD had substantially higher CES-D-10 scores than cisgender
21 lesbian or gay females, with an average score 3.38 points (95% CI: 1.172-5.595) higher after
22 adjusting for other covariates. A clear trend by age was observed in models 3 and 4 (see
23 Table 3), with younger respondents having significantly poorer mental health than older
24 individuals, both for stress and significant depressive symptomology, after adjusting for other
25 covariates.

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6 2 **Discussion**
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8 4 In this study we present data on the levels of depression, stress, and experiences of
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10 5 discrimination of LGBTQ+ people during the COVID-19 pandemic. We show that scores for
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12 6 stress and depressive symptoms among our LGBTQ+ sample are high, and higher than
13
14 7 observed in community samples and vulnerable populations in the recent past (for example ²⁴
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16 8 ²⁶). Furthermore, the pandemic may not be impacting the LGBTQ+ acronym evenly, with
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18 9 TGGD individuals having particularly high scores for stress and depressive symptoms
19
20 10 relative to cisgender gay and lesbian individuals. Non-heterosexual respondents who are
21
22 11 cisgender but do not identify as lesbian or gay also had elevated scores for stress and
23
24 12 depressive symptoms. Similarly, there was a clear age gradient with younger LGBTQ+
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26 13 people having much higher risks of showing symptoms of stress and depression.
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33 15 Our analyses of discrimination reinforce the theoretical basis for undertaking analyses of
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35 16 LGBTQ+ health and mental health, with LGBTQ+ people theorised at greater risk of health
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37 17 complications due to a unique set of internal and external homophobic, heteronormative, and
38
39 18 transphobic stressors. ²⁷ We found that almost one-in-five respondents reported experiencing
40
41 19 some form of discrimination during the pandemic, with TGGD respondents again at
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43 20 heightened risk of experiencing discrimination relative to other LGBTQ+ groups. Our results
44
45 21 show that experiencing discrimination was a risk factor for higher stress and depressive
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47 22 symptomology; the odds of reporting depressive symptomatology among individuals who
48
49 23 had experienced discrimination were three times higher than among individuals who had not
50
51 24 experienced any discrimination. Open ended responses to the survey described various
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53 25 experiences of discrimination and inappropriate incidents including increased or excessive
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55 26 scrutiny, misgendering, and online abuse.
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5 2 To further understand the results, we explored how mental health and discrimination varied
6
7 3 over the course of the pandemic. We observed that mental health scores in the sample were
8
9 4 poorer during the period April 27th-May 10th (the moment of ‘maximum risk’ as defined by
10
11 5 the UK Prime Minister) and during the period between May 23rd-June 14th (coinciding with
12
13 6 revelations of lockdown breaches by government officials in the UK, transphobic comments
14
15 7 on social media made by high profile people, and protests surrounding the murder of George
16
17 8 Floyd), although these differences were not significant. Similarly, we observed non-
18
19 9 statistically significant differences in the proportion of respondents reporting instances of
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21 10 discrimination, with the initial easing of the lockdown and particularly the period from June
22
23 11 15th onwards coinciding with increases in discrimination (see Figure 1), albeit based on a
24
25 12 small sample in the latter period.
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33 14 *FIGURE 1 HERE*
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37 16 **Limitations**

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39 17 Due to relatively small sample sizes, we have not been able to fully examine the diversity of
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41 18 the LGBTQ+ community, and fully examine how experiences vary according to social
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43 19 locations such as ethnicity, age, and gender identity. Studies in the US show that the highest
44
45 20 levels of violence are reported among transgender women of colour, and among young and
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47 21 low-income transgender people,^{13 14} suggesting that violence on the basis of transgender
48
49 22 identity or expression often affects the most marginalized subpopulations. Although we have
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51 23 adjusted for these factors in our models, we have not been able to further disaggregate across
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53 24 social locations to examine the role of interlocking systems of oppression in patterning
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55 25 experiences of discrimination and adverse mental health.
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3 1 While our data collection efforts are limited by the inherent challenge of surveying a small,
4
5 2 dispersed, diverse, and difficult to reach population, it is nonetheless critically important to
6
7 3 study the lives and experiences of discrimination and mental health among LGBTQ+
8
9 4 communities because of the stark health and social inequalities they experience.
10
11
12 5 New purposeful data collection was deemed appropriate as although a number of large
13
14 6 representative studies (e.g. the UK Household Longitudinal Study) are currently collecting
15
16 7 data on COVID-19 experiences, they typically contain small numbers of LGBTQ+ people, ⁶
17
18 8 ¹⁰ often do not collect information on TGGD identities, and contain heteronormative
19
20 9 measures that can be exclusionary to LGBTQ+ respondents. An online convenience sample
21
22 10 was deemed appropriate due to the absence of robust data on LGBTQ+ people from large
23
24 11 surveys that could help to determine the characteristics of a representative sample of
25
26 12 LGBTQ+ people. An online approach was particularly suitable for those respondents who
27
28 13 may have been sheltering or shielding in households where their LGBTQ+ status was
29
30 14 unknown to other members of the household. Furthermore, this approach is in line with other
31
32 15 recent large scale efforts at understanding the health of LGBT people in the UK. ²³ We do,
33
34 16 nevertheless, acknowledge that an online convenience sample can introduce potential issues
35
36 17 around sample selection and the possibility that those living in stressful situations or with
37
38 18 depressive symptoms were more likely to self-select into the survey.
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47 **Public Health Implications**

48
49 21 Results from the Queerantime Study suggest that groups within LGBTQ+ acronym may be at
50
51 22 differential risk of exhibiting stress or depressive symptomology, although the sample as a
52
53 23 whole may also be at higher risk than the general population of stress and depressive
54
55 24 symptomology due to minority stress. Homophobic and transphobic harassment and
56
57 25 exclusion experienced during the pandemic has a deleterious impact on LGBTQ+ mental
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1 health, demonstrated by the strong and consistent associations between harassment and
2 poorer mental health in the models. Open-ended responses to survey questions emphasise the
3 importance of LGBTQ+ social networks, often facilitated by the work of LGBTQ+
4 organisations, in supporting LGBTQ+ individuals. However, these are the very organisations
5 who are facing financial challenges with many now on the brink of closure.²⁸

6
7 Globally, LGBT+ rights organisations have alerted policy-makers about the need to address
8 the vulnerability of the LGBTQ+ community to the coronavirus pandemic, including
9 collecting sexual orientation and gender identity data for COVID-19 cases, increased
10 socioeconomic support for disadvantaged individuals, and support for organisations working
11 with the community.²⁹ Our findings provide support to these demands given the documented
12 high prevalence of depression and stress, and the concerning reports of experiences of
13 discrimination. Poor LGBTQ+ mental health may remain unchecked without substantial
14 commitment and funding directed to ameliorating health inequalities exacerbated by the
15 pandemic.

16 17 **Contributors**

18 DK and LB are equal contributors to this study. Both designed the Queerantime survey,
19 developed the research focus, analysed the data, and drafted and edited the manuscript. DK
20 and LB are the guarantors for this study and gave full approval of this version to be
21 published.

22 23 **Data sharing statement**

24 No additional data are available.

25

1 **Ethical approval**

2 Ethical approval was obtained from the ethics board of the University of Sussex
3 (ER/LB516/4) and University College London (REC 1335).
4

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7 or not-for-profit sectors.
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14 social media expertise that helped to boost the response rate.
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1 Tables and Figures

2 **Table 1: Mental health, experiences of discrimination, and sociodemographic**
3 **characteristics of the Queerantime Study respondents**

	Cis female Gay/Lesbian	Cis female bisexual/ other/ don't know/ prefer not to say	Trans- gender and Gender Diverse (TGGD)	Cis male Gay	Cis male bisexual/ other/don't know/ prefer not to say	Total
	%	%	%	%	%	%
Mental health outcomes						
PSS-4 Score, M(SD)	6.44 (3.18)	8.33 (3.14)	8.96 (2.99)	7.03 (2.97)	9.00 (3.37)	7.672 (3.218)
CES-D-10, M(SD)	12.0 (6.65)	15.0 (5.86)	17.15 (6.6)	12.75 (7.17)	16.15 (7.5)	14.174 (6.948)
Depressive Symptomology						
No evidence (<10)	36.62	18.33	16.44	38.71	15.38	28.06
Evidence of depressive symptomology (≥10)	63.38	81.67	83.56	61.29	84.62	71.94
Any harassment or inappropriate incidents						
None reported	74.65	81.67	64.38	87.10	84.62	77.81
Harassment reported	19.72	13.33	28.77	7.53	15.38	16.72
No information	5.63	5.00	6.85	5.38	0	5.47
Age Group						
18-24	9.86	18.33	31.51	2.15	30.77	15.11
25-34	18.31	45.00	31.51	32.26	23.08	30.87
35-44	39.44	23.33	16.44	31.18	23.08	27.65
45-54	23.94	10.00	16.44	23.66	15.38	19.29
55+	8.45	3.33	4.11	10.75	7.69	7.07
Change in perceived social status						
Negative change in status	25.35	26.67	36.99	23.66	23.08	27.65
No change	52.11	43.33	35.62	51.61	61.54	46.95
Positive change	22.54	30.00	27.40	24.73	15.38	25.40
Total						100.00
Relationship status						
Single	21.13	25.00	42.47	19.35	23.08	26.37
Dating or in a relationship but not living together	21.13	30.00	19.18	26.88	46.15	25.08
Cohabiting/Married/Civil Partnership	56.34	45.00	34.25	49.46	30.77	45.98
Divorced, Widowed or Prefer Not to Say	1.41	0	4.11	4.30	0	2.57
Identify as ethnic minority						
Not an ethnic minority	87.32	81.67	90.41	83.87	76.92	85.53
Ethnic minority	12.68	16.67	9.59	12.90	23.08	13.18
Prefer Not to Say	0	1.67	0	3.23	0	1.29
Location						
UK	81.69	80.00	82.19	90.32	76.92	83.60
Rest of the world	18.31	20.00	17.81	9.68	23.08	16.40
Total (%)	100.00	100.00	100.00	100.00	100.00	100.00
Total (N)	71	60	73	93	13	310

Table 2: Logistic regression results for unadjusted and adjusted associations between gender identity/sexual orientation and discrimination during COVID-19 pandemic (Odds ratios and exponentiated standard errors in brackets)

	Experiences of discrimination	
	Model 1	Model 2
	O.R. (SE)	O.R. (SE)
Gender ID and Sex Orientation baseline: Transgender and gender diverse		
Cis female Gay/Lesbian	0.576 (0.228)	0.743 (0.320)
Cis female Bisexual/other/don't know/prefer not to say	0.364** (0.167)	0.361** (0.172)
Cis male gay	0.218*** (0.0985)	0.237*** (0.116)
Cis male Bisexual/other/don't know/prefer not to say	0.364 (0.293)	0.334 (0.278)
Age group baseline: 18-24 years		
25-34 years		0.981 (0.436)
35-44 years		0.302** (0.168)
45-54 years		0.409 (0.225)
55+ years		1.567 (0.957)
Ethnic minority (baseline: not an ethnic minority)		
		1.345 (0.653)
Location: Rest of the world (baseline: UK)		
		0.530 (0.258)
Observations	295	295

*** p<0.01, ** p<0.05, * p<0.1

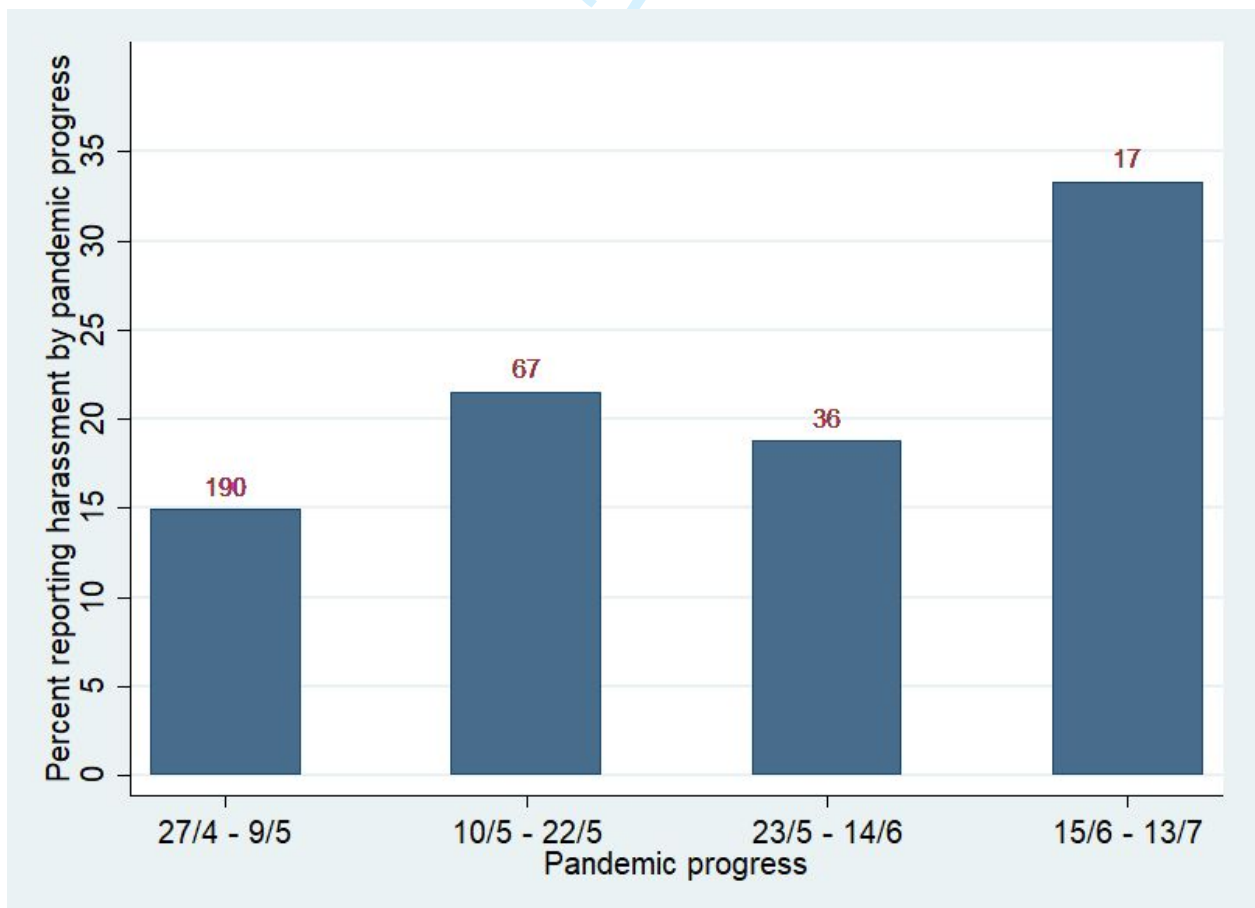
Table 3: Results of unadjusted and adjusted OLS Regression for PSS-4 score (Models 1 and 2; regression coefficients and standard errors in brackets) and unadjusted and adjusted logistic regression results for odds of significant depressive symptomatology indicated by CES-D-10 scores ≥ 10 (Models 3 and 4; odds ratios and exponentiated standard errors in brackets)

	Model 1	Model 2	Model 3	Model 4
	B(SE)	B(SE)	B(SE)	B(SE)
Any harassment or inappropriate incidents baseline: None				
Form of harassment reported	1.882*** (0.470)	1.436*** (0.467)	4.228*** (2.120)	3.252** (1.699)
No information	-0.378 (0.755)	-0.756 (0.733)	2.325 (1.541)	1.796 (1.256)
Gender ID and Sex Orientation baseline: Cis female Gay/Lesbian				
Cis female Bisexual/other/don't know/prefer not to say	2.014*** (0.527)	1.367*** (0.519)	2.881** (1.219)	2.154* (0.971)
Transgender and gender diverse	2.357*** (0.502)	1.561*** (0.504)	2.748** (1.126)	1.904 (0.853)
Cis male gay	0.824* (0.476)	0.769* (0.464)	1.061 (0.355)	0.986 (0.355)
Cis male Bisexual/other/don't know/prefer not to say	2.624*** (0.906)	1.982** (0.878)	3.626 (2.961)	2.553 (2.175)
Age group baseline: 18-24 years				
25-34 years		-1.070** (0.537)		0.558 (0.319)
35-44 years		-1.995*** (0.558)		0.480 (0.274)
45-54 years		-2.401*** (0.596)		0.309** (0.181)
55+ years		-3.384*** (0.774)		0.361 (0.258)
Change in social status since pandemic baseline: positive change				
Negative change in status		1.375*** (0.456)		1.653 (0.670)
No change		0.217 (0.410)		0.882 (0.300)
Relationship status baseline: Single				
Dating or in a relationship but not living together		0.225 (0.461)		0.953 (0.409)

Cohabiting/Married/Civil Partner	-0.332		0.499*
	(0.420)		(0.182)
Divorced, Widowed or Prefer not to say	-0.328		0.625
	(1.085)		(0.529)
Ethnicity baseline: not an ethnic minority			
Ethnic Minority	-0.378		1.525
	(0.495)		(0.674)
Prefer not to say	1.621		1.778
	(1.470)		(2.189)
Location: Rest of the world (baseline: UK)			
	-0.0235		1.076
	(0.454)		(0.425)
Constant	6.087***	7.774***	
	(0.372)	(0.688)	
Observations	310	310	310
R-squared	0.147	0.263	

*** p<0.01, ** p<0.05, * p<0.1

Figure 1: Proportion of respondents reporting discrimination by period in the pandemic



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2 **Supplementary Table 1 – Continuous model estimates of CES-D-10**

	Model 1	Model 2
	B(SE)	B(SE)
Any harassment or inappropriate incidents baseline: None		
Form of harassment reported	3.875*** (1.028)	2.700** (1.045)
No information	0.257 (1.651)	-0.623 (1.641)
Gender ID and Sex Orientation baseline: Cis female Gay/Lesbian		
Cis female Bisexual/other/don't know/prefer not to say	3.249*** (1.153)	2.132* (1.162)
Transgender and gender diverse	4.797*** (1.098)	3.383*** (1.128)
Cis male gay	1.226 (1.042)	1.027 (1.040)
Cis male Bisexual/other/don't know/prefer not to say	4.336** (1.983)	2.781 (1.965)
Age group baseline: 18-24 years		
25-34 years		-1.932 (1.203)
35-44 years		-2.899** (1.250)
45-54 years		-4.453*** (1.335)
55+ years		-3.974** (1.733)
Change in social status since pandemic baseline: positive change		
Negative change in status		2.649*** (1.021)
No change		0.746 (0.919)
Relationship status baseline: Single		
Dating or in a relationship but not living together		0.440 (1.032)
Cohabiting/Married/Civil Partner		-1.979** (0.941)
Divorced, Widowed or Prefer not to say		0.416 (2.429)
Ethnicity baseline: not an ethnic minority		
Ethnic Minority		0.404 (1.109)
Prefer not to say		1.076

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		(3.292)	
Location: Rest of the world (baseline: UK)		-0.0193	
		(1.016)	
Constant	11.22***	14.31***	
	(0.813)	(1.540)	
Observations	310	310	
R-squared	0.126	0.208	

*** p<0.01, ** p<0.05, * p<0.1

For peer review only

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	8
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	8
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9, 23-24
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	9, 23-24

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Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12, 24-26
		(b) Report category boundaries when continuous variables were categorized	10-12, 24-26
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	12-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13-14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	13-14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Discrimination as a predictor of mental health issues among LGBTQ+ people during the COVID-19 pandemic: cross-sectional analysis of the online Queerantime Study

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Abstract

Objectives: To assess the mental health and experiences of discrimination amongst Lesbian, Gay, Bisexual, Transgender, Queer people (LGBTQ) at the start of the COVID-19 pandemic.

Design: Data come from a cross-sectional online survey targeted at LGBTQ+ people, which collected data on mental health, experiences of discrimination, and a number of other pandemic-related experiences. To examine the association between sexual orientation and gender, and mental health and experiences of discrimination, we conducted regression analyses that adjusted for a range of sociodemographic variables.

Setting: A web-based survey was used to collect data between the end of April and mid-July 2020.

Participants: An analytical sample of 310 LGBTQ+ respondents aged 18 and over.

Main outcome measures: We assessed mental health with the 4-item Perceived Stress Scale (PSS-4), and with the 10-item Center for Epidemiological Studies Depression scale (CES-D-10). We asked respondents about discriminatory experiences because of their LGBTQ+ identity during the coronavirus pandemic.

Results: Perceived stress scores among our LGBTQ+ sample were high (Mean: 7.67; Standard Deviation: 3.22). Based on a score of ten or over on the CES-D-10, the majority of participants had high levels of depressive symptoms (72%). Around one-in-six respondents reported some form of discrimination since the start of the pandemic because they were LGBTQ+ (16.7%). The average score for perceived stress increased by 1.44 points (95% Confidence Interval (CI): 0.517-2.354) for respondents who had experienced discrimination versus those who had not. Similarly, the odds of exhibiting significant depressive symptomology increased three-fold among those who had experienced discrimination compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052).

Conclusions: The LGBTQ+ community exhibited increased levels of depression, stress, and experienced discrimination during the coronavirus pandemic. Increased levels of poor mental health were partially explained by experiences of discrimination which had a large, consistent and pernicious impact on mental health.

Keywords: COVID-19; LGBTQ+; mental health; stress; discrimination.

Article summary – strengths and limitations of this study

- This study uses tools that have been validated among diverse populations to identify high levels of perceived stress and depressive symptoms among LGBTQ+ people.
- An online convenience sample was deemed appropriate for a number of reasons including the inherent risk of transmission of COVID-19 with methods involving physical contact and to better include respondents who were sheltering or shielding in households where their LGBTQ+ status was concealed .
- An online convenience sample can introduce issues around representativeness and the possibility that those with greater mental health issues self-selected into the survey.
- Due to relatively small sample sizes, we have not been able to fully examine the diversity of the LGBTQ+ community.
- Designing a survey that captured LGBTQ+ specific experiences allowed us to identify that sexuality- and gender-based discrimination experienced during the pandemic is an important predictor of mental health issues.

1 Introduction

2 The coronavirus pandemic has exposed and magnified existent societal and health inequities
3 operating across multiple and intersecting systems of oppression.^{1 2} Given documented stark
4 health and socioeconomic inequalities across social locations related to sexuality, and gender
5 expression and identity,³ the coronavirus disease (COVID-19) and subsequent social and
6 economic implications could be expected to have disproportionate impacts on Lesbian, Gay,
7 Bisexual, Transgender, and Queer people (LGBTQ+, the “plus” including those who identify
8 as non-heterosexual and/or non-cisgender in another way).

9
10 Higher levels of pre-existing health conditions compared to cisgender and heterosexual
11 populations, may place the LGBTQ+ community at additional risk of adverse prognosis. This
12 includes long-term chronic illness, and higher rates of smoking and asthma among LGBTQ+
13 people;⁴⁻⁷ higher rates of obesity, and alcohol consumption among lesbian, bisexual, and
14 queer women;⁷⁻⁹ and increased likelihood of being immunocompromised (e.g. HIV+ with a
15 low CD4 cell count or with untreated HIV) among gay men and transgender people.¹⁰ In
16 addition, the impacts of social distancing and lockdown may be felt acutely by LGBTQ+
17 people, who were at greater risk of poorer mental health prior to the pandemic including
18 higher risks of suicide attempts and suicidal ideation, higher levels of common mental
19 disorders, and lower levels of mental wellbeing.^{11 12 13} For example, studies using the 4-item
20 Perceived Stress Score (PSS-4), a measure used in the present study (see methods), have
21 found mean values have ranged between 6.75 and 7.43 for US college students who identified
22 as ‘homosexual’ and bisexual respectively, compared to 6.09 among heterosexual students.¹⁴
23 Similarly, studies examining depression using the Center for Epidemiological Studies
24 Depression Scale (CES-D-10), a measure of depressive symptomatology used in the present
25 study (see methods), have found that the proportion reporting substantial depressive

1 symptomology among African American LGB young people to stand at roughly double that
2 of heterosexual young people in the southern United States (56.1% vs 28.4%).¹⁵

3 Comparative data on LGBTQ+ experiences during the pandemic are rare, although in the UK
4 general population the average stress score (using the PSS-4 scale) was estimated to be 6.48
5 (Standard Deviation: 3.3),¹⁶ above a 6-point threshold used to indicate 'high' levels of stress
6 elsewhere.¹⁷ Estimates within the general (US) population during the COVID-19 pandemic
7 have suggested that up to a third of people may be experiencing substantial depressive
8 symptomology (using the CES-D-10 scale).¹⁸

9
10 Within the heterogeneous LGBTQ+ umbrella term, individual groups may be positioned at a
11 distinct disadvantage. Transgender and gender-diverse (TGGD) individuals have a gender
12 that differs from the culturally-bound gender associated with one's assigned birth.¹⁹ TGGD
13 people are known to experience higher rates of adverse mental health compared to cisgender
14 individuals (people whose gender matches their sex assigned at birth), particularly anxiety,
15 depression, and suicidality.^{5 6 20}

16
17 Despite the accumulation of evidence indicating poorer health among LGBTQ+ people
18 predating the pandemic, there is a dearth of information on whether the hypothesised
19 additional risks outlined above have actually materialised in poorer outcomes among
20 LGBTQ+ people during the COVID-19 pandemic. Indicative evidence suggests that some
21 LGBTQ+ groups may exhibit higher levels of psychological trauma during the COVID-19
22 pandemic²¹ and other studies suggest that mental health among LGBTQ+ people may have
23 deteriorated during the pandemic compared to pre-pandemic levels.²² Certainly, LGBTQ+
24 people face stressors during the pandemic that are not shared with heterosexual and cisgender
25 people, including spending periods of 'lockdown' in households that are not affirming or

1 supportive of their sexual orientation or gender identity or expression, ²³ being separated from
2 social networks that are supportive and affirming to their identity, ^{24 25} and interruptions to
3 accessing gender affirming care among transgender and gender non-binary people ^{26 27}.

4
5 Theoretical frameworks including the Minority Stress Model suggest that stark health
6 inequalities are the result of distal and proximal stressors caused by living within a
7 homophobic, heterosexist, transphobic culture, results in cumulative experiences of
8 discrimination, harassment, victimization, expectations of rejection, and internalized
9 transphobia and homophobia. ^{28 29} These experiences have been extensively documented
10 across several studies, where high prevalence of experiences of stigma and discrimination has
11 been reported among the LGBTQ+ community. ^{30 31} During the pandemic, experiences of
12 discrimination may have become magnified because, as described above, LGBTQ+ people
13 may have been sheltering in households that were unsupportive or hostile towards their
14 identities, ²³ or have not received support from networks and relevant organisations. In some
15 contexts, the pandemic has triggered a rise in hate speech and targeted attacks on the
16 LGBTQ+ community, and members of the LGBTQ+ community have been blamed for the
17 very emergence of the virus. ³² Unrelated to the coronavirus itself, the lockdown coincided
18 with online debates around sex and gender, which have manifested in transphobic comments
19 made and supported by high profile figures, and a hostile online environment for many
20 transgender people. ³³ These attacks occurred at a time when many in the community were
21 unable to draw on their usual support networks.

22
23 In the context of the coronavirus pandemic where existent inequalities are being exacerbated
24 across social locations, ² it is paramount to document how the LGBTQ+ community has fared
25 during the initial stages of the coronavirus pandemic. The present study aims to address this

1 need through analysing data from the Queerantime Study (a portmanteau Queer and
2 Quarantine), a web-based survey that assesses how LGBTQ+ adults are experiencing the
3 coronavirus pandemic. In the present paper, we examine extent to which respondents to the
4 Queerantime survey experienced forms of sexuality or gender-based discrimination, including
5 harassment and exclusion, during the coronavirus pandemic. We also examine how
6 widespread experiences of perceived stress and depressive symptomology were among
7 respondents to the Queerantime survey and examine to what extent instances of harassment
8 and exclusion predict poorer mental health among LGBTQ+ respondents during the
9 coronavirus pandemic.

10

11 **Methods**

12 Data collection was conducted via a cross-sectional, web-based anonymous survey. It began
13 on 27th April 2020 and ended on 30th December 2020.. Twitter, Facebook and Instagram
14 accounts were created for the study and were used to disseminate links to the survey in order
15 to maximise the response rate. We contributed guest blogs and created a website in order to
16 help publicise the study (<https://queerantinestudy.wixsite.com/queerantime>). The link to the
17 survey was distributed through a number of LGBTQ+ organisations including through the
18 newsletter of the LGBT Consortium, the largest network of LGBT+ groups, projects and
19 organisations in the UK, as well as directly by local organisations such as the East London
20 Out Project (ELOP). The target sample included respondents aged 18 and over, and who self-
21 identify as lesbian, gay, bisexual, queer, as having another minority sexual orientation; or
22 who were transgender or gender diverse in other ways including being non-binary or intersex.
23 Cisgender respondents who self-identify as heterosexual were not excluded from the survey,
24 although recruitment and survey design were tailored towards the LGBTQ+ community, and
25 their responses were not included in the analyses presented here. The Queerantime survey

1 asked respondents about their sociodemographic characteristics, their physical and mental
2 health, health behaviours, and experiences and anxieties relating to the pandemic and their
3 identity. Ethical approval was obtained from the ethics board of the University of Sussex
4 (ER/LB516/4) and University College London (REC 1335).

6 **Patient and Public Involvement**

7 Expert input from a representative of a national LGBT umbrella organisation broadened the
8 focus of the survey to consider how respondents had experienced changes in support from
9 LGBTQ+ service providers and organisations; this input also helped to shape the measures
10 around gender. Community organisations also helped in the dissemination of the study
11 through social media and inclusion of the study within newsletters. However, no further
12 public involvement was sought in the design or analysis of the survey.

14 **Outcome variables**

15 In this analysis we focus on three outcomes: depressive symptoms, perceived stress, and
16 experiences of discrimination. We assessed depression with the 10-item Center for
17 Epidemiological Studies Depression Scale (CES-D-10), which asks respondents to consider
18 how much in the past week they have experienced feelings of loneliness, happiness, and fear.
19 ³⁴ The CES-D-10 includes three items on depressed affect, five items on somatic symptoms,
20 and two on positive affect. ³⁵ Scores range between 0 and 30 with good levels of internal
21 consistency in our analytical sample (Cronbach's $\alpha=0.87$). Thresholds were used to denote
22 significant depressive symptoms' based on a score of ten or over ³⁴. In the present study we
23 mainly examine the CES-D-10 as a binary measure, with supplementary analyses presenting
24 data on CES-D-10 in continuous models.

1 We measured stress with the 4-item Perceived Stress Scale (PSS-4), which assesses the extent
2 to which situations in life are viewed as stressful.³⁶ The scale asks respondents about
3 respondents' perceived ability to control important things in life, confidence in handling
4 personal problems, the extent to which they felt things were going their way, and whether
5 difficulties were piling up so high they were becoming insurmountable, using the past month
6 as a frame of reference. Scores range between 0 and 15, and have good levels of internal
7 consistency in our analytical sample (Cronbach's $\alpha=0.83$).

8
9 We measured experiences of discrimination with a set of options that asked respondents
10 whether, since the start of the coronavirus pandemic, they had experienced verbal
11 harassment, physical harassment, sexual harassment, threats of violence, exclusion from
12 events/activities, involuntary disclosure of LGBTQ+ identity, or other forms of inappropriate
13 treatment because they were LGBTQ+ or were perceived as being LGBTQ+. Individual
14 measures were combined into one summary variable of 'any discrimination.'

16 **Sexual orientation and gender**

17 Gender was assessed using the recommended two-step method³⁷ with two items: (1) the
18 gender that participants felt best represented them (options included: Female (including trans
19 woman); Male (including trans man); Non-binary; Other (free text category)), and (2)
20 whether this gender was the same as assigned at birth (options included: Yes; No; Don't
21 Know). The two items were cross-tabulated to categorise participants as either transgender
22 and gender diverse (TGGD) or cisgender. Sexual orientation was captured with a question
23 that asked participants to select their sexual orientation from the following categories:
24 Bisexual; Gay/Lesbian; Heterosexual/Straight; Don't know; Prefer not to say; and an Other,
25 free-text category. Using pre-defined response categories, respondents could only select one

1 category, although those who identified with multiple categories (e.g. Queer and Bisexual or
2 Male and Non-binary) could use the free-text option to state this, with respondents declaring
3 more than one gender being categorised as transgender and gender diverse, and respondents
4 selecting more than one sexual orientation categorised as having another non-heterosexual
5 orientation.

6
7 We present data on sexual orientation and gender as different constructs in supplementary
8 analyses, although the main analyses use a variable that examines the intersection of sexual
9 orientation and gender using five categories: (i) cisgender female lesbian/gay; (2) cisgender
10 female with another non-heterosexual orientation (including bisexual, other, don't know, and
11 prefer not to say); (3) transgender and gender diverse; (4) cisgender male gay; (5) cisgender
12 male with another non-heterosexual orientation (including bisexual, other, don't know, and
13 prefer not to say).

14 15 **Covariates**

16 We adjusted for variables thought to confound the association between our exposure and
17 outcome variables. Socioeconomic status was measured through a variable that asked
18 respondents about their subjective social status (modelled on an approach used in general
19 population surveys³⁸), and how this had changed since the start of the pandemic, with
20 categories reflecting no change, positive change, and negative change.

21 22 **Analytical plan**

23 Data for the present analyses includes responses collected until 13 July 2020. The analysis
24 mainly consisted of a complete case analysis of respondents, although a dummy category of
25 no information (missing) for the harassment variable was created for models of mental health

1 in order to preserve sample size. Summary statistics were calculated for baseline
2 characteristics and associations between exposure variables and outcomes were tested in
3 unadjusted analyses using the χ^2 test of association and ANOVA as appropriate. The
4 modelling began with exploring selected predictors of discrimination before examining how
5 discrimination itself predicted poorer mental health. Binary logistic regression models were
6 constructed for harassment and high depressive symptomology; Ordinary Least Squares
7 (OLS) regression models were constructed for continuous models of perceived stress and
8 depressive symptoms. Results for both binary and continuous specifications of CES-D-10 are
9 discussed, with the results for the continuous specification included in supplementary
10 analyses, as a form of sensitivity analysis. For models where discrimination is the outcome of
11 interest we only adjusted for sexual orientation and gender, age, ethnicity, and location. For
12 models where depressive symptomology or perceived stress are the outcomes of interest, we
13 used the measure of discrimination as the main exposure variable, and adjusted for the same
14 covariates as above as well socioeconomic status and relationship status. A different set of
15 controls was used between models as the potential confounders were theorised to differ
16 slightly and due to the lower number of 'events' in the model of discrimination.
17 Additional analysis examining when in the pandemic harassment and discrimination occurred
18 is also included to contextualise the discussion. Adjusted and unadjusted models are
19 presented, and in line with suggested practice, estimates were evaluated based the exact p-
20 value, the magnitude of the coefficients and the width of the confidence intervals, rather than
21 on a single test statistic.³⁹ We conducted all analyses in Stata 14.⁴⁰ The decision on how to
22 present the findings across diverse identities is challenging, particularly as we combined
23 information on sexual orientation and gender in deriving categories. Our decisions reflected
24 considerations of the conceptual similarities/differences between groups, the numbers across
25 groups within our sample, as well as the decision to adopt an 'inclusive' or 'specific'

1 approach⁴¹ when analysing the data based on observed differences in key variables. Some
2 preliminary analysis (not shown) was undertaken to explore the validity of bringing different
3 groupings together before the decision was taken to use five main categories combining
4 sexual orientation and gender.

6 **Results**

7 Between April 27th and July 13th we received a total of 426 responses. Of these 24 were
8 excluded because they did not provide their age, and 4 were excluded because they were aged
9 under 18. Of the remaining 398, we were able to calculate PSS-4 and CES-D-10 scores for
10 325 and 324 respondents respectively. Once we had accounted for missingness on other
11 covariates, the analytical sample consisted of 310 respondents for models of mental health,
12 excluding one further cisgender heterosexual respondent.

14 *TABLE 1 HERE*

16 Participants identified their sexual orientation and gender in a number of different ways. The
17 largest group identified as cisgender gay males (30.0%); almost a quarter of the sample
18 (23.5%) were categorised as TGGD (of different sexual orientations); cisgender gay and
19 lesbian females comprised 22.9% of the respondents; while cisgender females with another
20 non-heterosexual orientation accounted for 19.4% of respondents, and cisgender males with
21 another non-heterosexual orientation accounted for 4.2% of respondents. A further
22 breakdown of respondents' identities is available in the supplementary materials, with
23 descriptive information on key variables. Respondents aged 18-24 accounted for less than a
24 fifth of the sample (15.1%), while those aged 55+ accounted for less than a tenth of the
25 sample (7.1%), with a greater representation of respondents aged 25-54 years old.

1 Descriptively, the mean scores for PSS-4 suggested that the sample had high levels of
2 perceived stress (Mean (M): 7.67; Standard Deviation (SD): 3.22). Using the recommended
3 threshold of 10 or more to identify significant depressive symptomatology, we observed that
4 the majority of respondents fell into this category (71.9%). Cis-female respondents who
5 identify as gay or lesbian had the lowest scores for perceived stress or depressive symptoms
6 (see Table 1); conversely transgender and gender diverse individuals had the highest scores
7 (83.6%).

8
9 One-in-six respondents reported some form of harassment since the start of the pandemic
10 because they were LGBTQ+ (16.7%); the most common forms being verbal harassment
11 including insults or other hurtful comments (8.7%), exclusion from events or activities
12 (5.6%), and involuntary disclosure of LGBTQ+ identity (3.5%). Perceived stress was
13 markedly higher for those who had experienced discrimination (PSS-4 M: 9.44 SD: 2.99)
14 compared to those who had not (PSS-4 M: 7.35 SD: 3.16). Respondents who had experienced
15 discrimination also had higher depressive symptomatology scores (CES-D-10 M: 17.87 SD:
16 6.21) compared to those who had not (CES-D-10 M: 13.43 SD: 6.97).

17
18 *TABLE 2 HERE*

19
20 We examined the relationship between gender and sexual orientation and discrimination in
21 logistic regression models (see Table 2). Based on the association observed in Table 1, we
22 used TGGD as the reference category and explored whether the higher risk of TGGD people
23 to experience discrimination remained after controlling for basic sociodemographic
24 covariates. The results from adjusted models showed that the odds of experiencing
25 discrimination were lower for all other groups, and significantly lower in the case of

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2
3 1 cisgender gay males (OR: 0.237, 95% Confidence Interval (CI):0.091-0.617) and cisgender
4
5 2 females who identified with a sexual minority orientation other than gay/lesbian (OR: 0.361,
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7 3 CI: 0.141-0.921). Within the sample, the results were suggestive of a u-shaped trend in terms
8
9 4 of age, with the youngest and the oldest LGBTQ+ respondents in the sample being at greatest
10
11 5 risk of experiencing discrimination, although differences by age were generally not
12
13 6 statistically significant.
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18
19 8 Experiences of discrimination were clear predictors of poorer mental health. The average
20
21 9 score for perceived stress increased by 1.44 points (CI: 0.517-2.354) for those who had
22
23 10 experienced discrimination, compared to those who had not. Similarly, the odds of exhibiting
24
25 11 significant depressive symptomology (CES-D-10 scores of 10 or more) increased three-fold
26
27 12 among those who had experienced discrimination based on their gender or sexuality
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29 13 compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052). These marked
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31 14 associations remained after adjusting for potential confounders (see Models 1 to 4 in Table
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33 15 3).
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40 17 *TABLE 3 HERE*
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45 19 Cisgender female lesbian or gay respondents had lower perceived stress levels than other
46
47 20 LGBTQ+ groups. TGGD respondents and non-heterosexual cisgender males who didn't
48
49 21 identify as gay had among the highest average perceived stress scores in adjusted models.
50
51 22 Although similar trends were observed in the odds of experiencing depressive
52
53 23 symptomatology, the evidence was ultimately inconclusive for these groups, although
54
55 24 cisgender females with another non-heterosexual orientation besides lesbian or gay had a
56
57 25 higher risk of significant depressive symptoms relative lesbian/gay cisgender women. Further
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59
60

1 sensitivity analysis of the CES-D-10 as a continuous measure (see supplementary files)
2 shows that TGGD people had substantially higher CES-D-10 scores than cisgender lesbian or
3 gay females, with an average score 3.38 points (95% CI: 1.172-5.595) higher after adjusting
4 for other covariates. A clear trend by age was observed in models 3 and 4 (see Table 3), with
5 younger respondents having significantly poorer mental health than older individuals, both
6 for perceived stress and significant depressive symptomology, after adjusting for other
7 covariates.

8

9 **Discussion**

10 In this study we present data on the levels of depressive symptoms, perceived stress, and
11 experiences of discrimination of LGBTQ+ people during the COVID-19 pandemic collected
12 through a web-based survey. Respondent characteristics broadly mirrored the
13 sociodemographic characteristics of the recent UK government National LGBT Survey.⁴²
14 The distribution of respondents by sexual orientation was very similar, albeit with a higher
15 share of respondents who identified as Queer in the Queerantime survey (8% vs
16 approximately 1%). The proportion of respondents aged 18-24 was lower at 15.1%
17 (compared with approximately 37.4%), with higher proportions at older age groups in line
18 with the UK population as a whole. The Queerantime survey had a larger proportion of
19 participants who were TGGD than the UK National LGBT Survey (23.5% vs 15%).⁴²

20

21 We find that scores for perceived stress and depressive symptoms among our LGBTQ+
22 sample are high, and higher than observed in community samples and vulnerable populations
23 in the recent past (for example^{43 44}). Furthermore, we find that the pandemic may not be
24 impacting the LGBTQ+ community evenly, with TGGD individuals having particularly high
25 scores for perceived stress and depressive symptoms relative to cisgender gay and lesbian
26

1 individuals. Non-heterosexual respondents who are cisgender but do not identify as lesbian or
2
3 gay also had elevated scores for perceived stress and depressive symptoms. Similarly, there
4
5 was a clear age gradient with younger LGBTQ+ people having much higher risks of showing
6
7 symptoms of stress and depression. An important caveat to these results is that because of our
8
9 cross-sectional design, we are unable to definitively state that mental health status
10
11 *deteriorated* as a result of the pandemic and whether any deterioration in mental health was
12
13 concentrated among TGGD respondents or younger respondents; our study design also means
14
15 we are unable to make direct comparisons to ascertain whether LGBTQ+ people are faring
16
17 worse during the pandemic than heterosexual cisgender people. However, the underlying
18
19 pathways through which LGBTQ+ people may have experienced greater and specific
20
21 challenges during the pandemic and lockdown are becoming evident,²²⁻²⁷ providing a basis
22
23 for an assumption that LGBTQ+ people may have experienced greater stressors, with TGGD
24
25 people facing particular sets of stressors, albeit on a theoretical basis and in need of further
26
27 exploration and verification. Furthermore the very high levels of mental health issues
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29 uncovered here make it challenging to simply attribute such stark levels of mental health
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31 issues as the status quo pre-pandemic, although this assumption again needs further
32
33 exploration and verification using a different study design. Regardless, the data definitively
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35 show that the pandemic has had a pernicious effect on the mental health of the LGBTQ+
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37 community.
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49 Our analyses of discrimination reinforce the rationale for undertaking analyses of LGBTQ+
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51 health and mental health, with LGBTQ+ people theorised at greater risk of health
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53 complications due to a unique set of internal and external homophobic, heteronormative, and
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55 transphobic stressors.⁴⁵ We found that almost one-in-six respondents reported experiencing
56
57 some form of discrimination during the pandemic, with TGGD respondents again at
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59
60

1 heightened risk of experiencing discrimination relative to other LGBTQ+ groups. Our results
2 show that experiencing discrimination was a risk factor for higher perceived stress and
3 depressive symptomology; the odds of reporting depressive symptomatology among
4 individuals who had experienced discrimination were three times higher than among
5 individuals who had not experienced any discrimination. Open ended responses to the survey
6 described various experiences of discrimination and inappropriate incidents including
7 increased or excessive scrutiny, misgendering, exclusion, and online abuse.

8
9 To further understand the results, we explored how mental health and discrimination varied
10 over the course of the survey. We observed that mental health scores in the sample were
11 poorer during the period April 27th-May 10th (the moment of ‘maximum risk’ as defined by
12 the UK Prime Minister) and during the period between May 23rd-June 14th (coinciding with
13 revelations of lockdown breaches by government officials in the UK, transphobic comments
14 on social media made by high profile figures, and protests surrounding the murder of George
15 Floyd), although these differences were not significant. Similarly, we observed non-
16 statistically significant differences in the proportion of respondents reporting instances of
17 discrimination, with the initial easing of the lockdown and particularly the period from June
18 15th onwards coinciding with increases in discrimination (see Figure 1), albeit based on a
19 small sample in the latter period. These trends help contextualise the results and illuminate
20 the hostile environments which LGBTQ+ people, and particularly TGGD respondents, were
21 experiencing.

22
23 *FIGURE 1 HERE*

24 25 **Limitations**

1
2
3 1 Due to relatively small sample sizes, we have not been able to fully examine the diversity of
4
5 2 the LGBTQ+ community, and fully examine how experiences vary according to social
6
7 3 locations such as ethnicity, age, and gender. Studies in the US show that the highest levels of
8
9 4 violence are reported among transgender women of colour, and among young and low-
10
11 5 income transgender people,^{30 31} suggesting that violence on the basis of transgender identity
12
13 6 or expression often affects the most marginalised subpopulations. Although we have adjusted
14
15 7 for these factors in our models, we have not been able to further disaggregate across social
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17 8 locations to examine the role of interlocking systems of oppression in patterning experiences
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19 9 of discrimination and adverse mental health.
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26 11 While our data collection efforts are limited by the inherent challenge of surveying a small,
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28 12 dispersed, diverse, and difficult to reach population, it is nonetheless critically important to
29
30 13 study the lives and experiences of discrimination and mental health among LGBTQ+
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32 14 communities because of the stark health and social inequalities they experienced before the
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34 15 pandemic. Our choice of mental health measures reflected the need to field short scales
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36 16 within a web-based survey where there was no incentive provided for respondents to
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38 17 complete the questions. However, other more comprehensive or alternative measures of
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40 18 mental health, and particularly mental wellbeing, may have yielded further nuance to the
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42 19 results presented here.
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49 21 New purposeful data collection was deemed appropriate as although a number of large
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51 22 representative studies (e.g. the UK Household Longitudinal Study) are currently collecting
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53 23 data on COVID-19 experiences, they typically contain small numbers of LGBTQ+ people,⁸
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55 24 ¹² often do not collect information on TGGD identities, and contain heteronormative
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57 25 measures that can be exclusionary to LGBTQ+ respondents. An online convenience sample
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1 was deemed appropriate due to the absence of robust data on LGBTQ+ people from large
2 surveys that could help to determine the characteristics of a representative sample of
3 LGBTQ+ people, as well as the risks inherent with any form of physical data collection
4 during the pandemic. An online approach was particularly suitable for those respondents who
5 may have been sheltering or shielding in households where their LGBTQ+ status was
6 unknown to other members of the household. Furthermore, this approach is in line with other
7 recent large scale efforts at understanding the health of LGBT people in the UK.⁴² We do,
8 nevertheless, acknowledge that an online convenience sample can introduce potential issues
9 around sample selection, such as the omission of those without internet access, and the
10 possibility that those living in stressful situations or with depressive symptoms were more
11 likely to self-select into the survey. Although rudimentary checks for data patterns that could
12 indicate that ‘bots’ completed the survey were implemented, focussed on identifying cases
13 where the same response had been provided to all Likert scale type questions, or where the
14 middle response had been consistently provided, there remains a possibility that some
15 responses may be based on false or duplicate records. Further measures that could have been
16 implemented, such as password protection or identity checking, were not congruent with a
17 format that allowed respondents to complete the survey anonymously, or believe that they
18 were doing so.

19
20 As the inferential analysis consisted of three regression models where we show the
21 development of the model by including additional regressors, we did not implement
22 additional correction for multiple hypotheses (e.g. Bonferroni). We do note that, given a
23 scenario where 20 hypotheses were being tested at a 5% level, we would expect to see at least
24 one such deviation where we would interpret a result as being ‘statistically significant’

1 inappropriately ⁴⁶; however, as discussed earlier, we also took a broader approach to
2 evaluating estimates than interpreting p-values as being “significant” or “nonsignificant”. ³⁹

3

4 **Public Health Implications**

5 Results from the Queerantime Study suggest that groups within LGBTQ+ acronym may be at
6 differential risk of experiencing stress or depressive symptomology, although the sample as a
7 whole may also be at higher risk than the general population of stress and depressive
8 symptomology due to minority stress. Homophobic and transphobic harassment and
9 exclusion experienced during the pandemic has a deleterious impact on LGBTQ+ mental
10 health, demonstrated by the strong and consistent associations between harassment and
11 poorer mental health in the models. Open-ended responses to survey questions emphasise the
12 importance of LGBTQ+ social networks, often facilitated by the work of LGBTQ+
13 organisations, in supporting LGBTQ+ individuals. However, these are the very organisations
14 that are facing financial challenges with many on the brink of closure. ⁴⁷

15
16 Globally, LGBT+ rights organisations have alerted policy-makers about the need to address
17 the vulnerability of the LGBTQ+ community to the coronavirus pandemic, including
18 collecting sexual orientation and gender data for COVID-19 cases, increased socioeconomic
19 support for disadvantaged individuals, and support for organisations working with the
20 community. ⁴⁸ Our findings provide support to these demands given the documented high
21 prevalence of depressive symptomology and stress, and the concerning reports of experiences
22 of discrimination. Poor LGBTQ+ mental health may remain unchecked without substantial
23 commitment and funding directed to ameliorating health inequalities exacerbated by the
24 pandemic.

25

1 **Contributors**

2 DK and LB are equal contributors to this study. Both designed the Queerantime survey,
3 developed the research focus, analysed the data, and drafted and edited the manuscript. DK
4 and LB are the guarantors for this study and gave full approval of this version to be
5 published.

7 **Data sharing statement**

8 No additional data are available.

10 **Competing interests**

11 None to declare. Due to the nature of this research, participants of this study did not agree for
12 their data to be shared publicly, so supporting individual level data is not available.

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18 **Ethical approval**

19 Ethical approval was obtained from the ethics board of the University of Sussex
20 (ER/LB516/4) and University College London (REC 1335).

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 2 social media expertise that helped to boost the response rate. We would like to thank the peer
 3 reviewers of this article for their comments and suggestions on an earlier draft.

20 Figure 1 Proportion of respondents reporting discrimination by period in the pandemic

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40 Tables and Figures

41
42 21 **Table 1: Mental health, experiences of discrimination, and sociodemographic**
43 22 **characteristics of the Queerantime Study respondents**

	Cis female Gay/Lesbian	Cis female of another non- heterosexua l orientation	Trans- gender and Gender Diverse (TGGD)	Cis male Gay	Cis male of another non- heterosexua l orientation	Total
	%	%	%	%	%	%
Mental health outcomes						
PSS-4 Score, M(SD)	6.44 (3.18)	8.33 (3.14)	8.96 (2.99)	7.03 (2.97)	9.00 (3.37)	7.672 (3.218)
CES-D-10 Score, M(SD)	12.0 (6.65)	15.0 (5.86)	17.15 (6.6)	12.75 (7.17)	16.15 (7.5)	14.174 (6.948)
Evidence of significant depressive Symptomology						
No evidence (<10)	36.62	18.33	16.44	38.71	15.38	28.06

Evidence of significant depressive symptomology (≥ 10)	63.38	81.67	83.56	61.29	84.62	71.94
Any LGBTQ+ related harassment or inappropriate incidents						
None reported	74.65	81.67	64.38	87.10	84.62	77.81
Harassment reported ^s	19.72	13.33	28.77	7.53	15.38	16.72
No information (missing)	5.63	5.00	6.85	5.38	0	5.47
Age Group						
18-24	9.86	18.33	31.51	2.15	30.77	15.11
25-34	18.31	45.00	31.51	32.26	23.08	30.87
35-44	39.44	23.33	16.44	31.18	23.08	27.65
45-54	23.94	10.00	16.44	23.66	15.38	19.29
55+	8.45	3.33	4.11	10.75	7.69	7.07
Identify as ethnic minority						
Not an ethnic minority	87.32	81.67	90.41	83.87	76.92	85.53
Ethnic minority	12.68	16.67	9.59	12.90	23.08	13.18
Prefer Not to Say	0	1.67	0	3.23	0	1.29
Location						
UK	81.69	80.00	82.19	90.32	76.92	83.60
Rest of the world	18.31	20.00	17.81	9.68	23.08	16.40
Change in perceived social status						
Negative change in status	25.35	26.67	36.99	23.66	23.08	27.65
No change	52.11	43.33	35.62	51.61	61.54	46.95
Positive change	22.54	30.00	27.40	24.73	15.38	25.40
Total						100.00
Relationship status						
Single	21.13	25.00	42.47	19.35	23.08	26.37
Dating or in a relationship but not living together	21.13	30.00	19.18	26.88	46.15	25.08
Cohabiting/Married/Civil Partnership	56.34	45.00	34.25	49.46	30.77	45.98
Divorced, Widowed or Prefer Not to Say	1.41	0	4.11	4.30	0	2.57
Total (%)	100.00	100.00	100.00	100.00	100.00	100.00
Total (N)	71	60	73	93	13	310

Notes: M = Mean; SD = Standard Deviation; ^s see methods for types of incidents

Table 2: Logistic regression results for unadjusted and adjusted associations between gender identity/sexual orientation and discrimination during COVID-19 pandemic (Odds ratios and confidence intervals in brackets)

	Experiences of discrimination	
	Unadjusted	Adjusted
	O.R. (CI)	O.R. (CI)

Gender ID and Sex Orientation baseline: Transgender and gender diverse

Cis female Gay/Lesbian	0.576 (0.265 - 1.252)	0.743 (0.320 - 1.727)
Cis female of another non-heterosexual orientation	0.364** (0.147 - 0.897)	0.361** (0.141 - 0.921)
Cis male gay	0.218*** (0.090 - 0.529)	0.237*** (0.091 - 0.617)
Cis male of another non-heterosexual orientation	0.364 (0.075 - 1.765)	0.334 (0.066 - 1.704)

Age group baseline: 18-24 years

25-34 years		0.981 (0.411 - 2.347)
35-44 years		0.302** (0.102 - 0.896)
45-54 years		0.409 (0.139 - 1.205)
55+ years		1.567 (0.474 - 5.188)
Ethnic minority (baseline: not an ethnic minority)		1.345 (0.520 - 3.484)
Location: Rest of the world (baseline: UK)		0.530 (0.204 - 1.375)

Observations	295	295
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*** p<0.01, ** p<0.05, * p<0.1; O.R: Odds Ratio; CI: Confidence Interval

Table 3: Results of unadjusted and adjusted OLS Regression for PSS-4 score (Models 1 and 2; regression coefficients and confidence intervals in brackets) and unadjusted and adjusted logistic regression results for odds of significant depressive symptomology indicated by CES-D-10 scores ≥10 (Models 3 and 4; odds ratios and confidence intervals in brackets)

	PSS-4 score		CES-D-10 scores ≥10	
	Unadjusted B(CI)	Adjusted B(CI)	Unadjusted O.R. (CI)	Adjusted O.R. (CI)

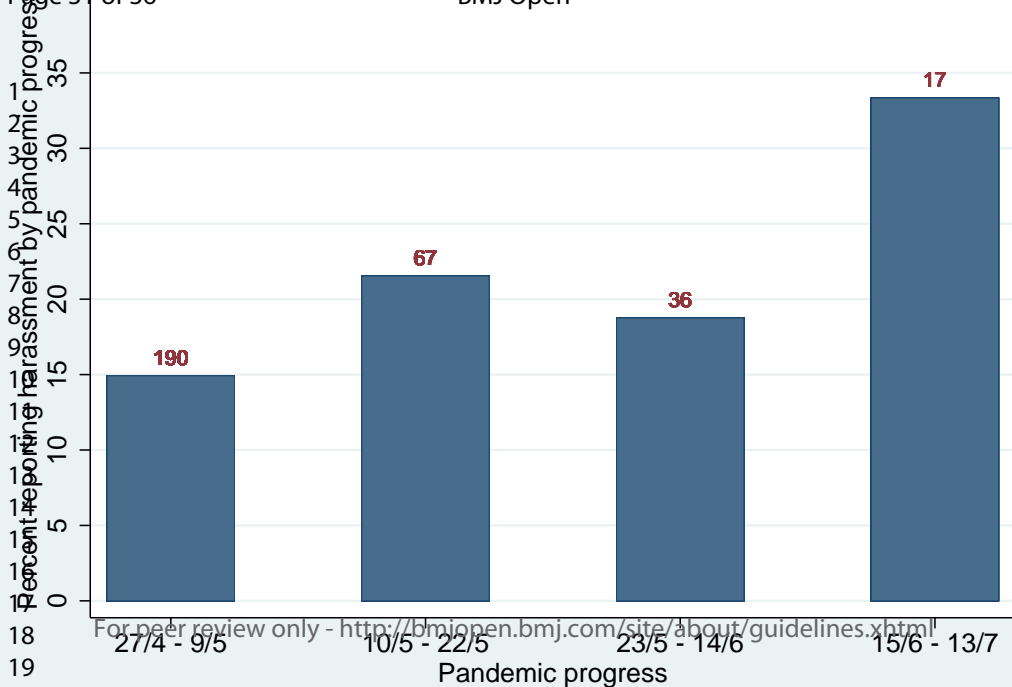
Any harassment or inappropriate incidents

1					
2					
3	baseline: None				
4	Form of harassment reported	1.882***	1.436***	4.228***	3.252**
5		(0.957 - 2.807)	(0.517 - 2.354)	(1.582 - 11.30)	(1.168 - 9.052)
6	No information	-0.378	-0.756	2.325	1.796
7		(-1.863 - 1.108)	(-2.198 - 0.686)	(0.634 - 8.520)	(0.456 - 7.074)
8	Gender ID and Sex				
9	Orientation baseline: Cis				
10	female Gay/Lesbian				
11					
12	Cis female of another non-	2.014***	1.367***	2.881**	2.154*
13	heterosexual orientation	(0.977 - 3.052)	(0.345 - 2.389)	(1.257 - 6.604)	(0.890 - 5.210)
14	Transgender and gender	2.357***	1.561***	2.748**	1.904
15	diverse	(1.369 - 3.345)	(0.570 - 2.552)	(1.231 - 6.134)	(0.791 - 4.580)
16	Cis male gay	0.824*	0.769*	1.061	0.986
17		(-0.113 - 1.761)	(-0.145 - 1.683)	(0.550 - 2.046)	(0.487 - 1.998)
18	Cis male of another non-	2.624***	1.982**	3.626	2.553
19	heterosexual orientation	(0.840 - 4.407)	(0.255 - 3.709)	(0.732 - 17.97)	(0.481 - 13.56)
20	Age group baseline: 18-24				
21	years				
22	25-34 years		-1.070**		0.558
23			(-2.127 - -0.0125)		(0.182 - 1.713)
24	35-44 years		-1.995***		0.480
25			(-3.094 - -0.897)		(0.157 - 1.470)
26	45-54 years		-2.401***		0.309**
27			(-3.574 - -1.228)		(0.098 - 0.974)
28	55+ years		-3.384***		0.361
29			(-4.907 - -1.860)		(0.089 - 1.469)
29	Change in social status since				
30	pandemic baseline: positive				
31	change				
32	Negative change in status		1.375***		1.653
33			(0.478 - 2.272)		(0.747 - 3.657)
34	No change		0.217		0.882
35			(-0.590 - 1.025)		(0.452 - 1.719)
36	Relationship status baseline:				
37	Single				
38	Dating or in a relationship but		0.225		0.953
39	not living together		(-0.682 - 1.132)		(0.410 - 2.211)
40	Cohabiting/Married/Civil		-0.332		0.499*
41	Partner		(-1.159 - 0.496)		(0.244 - 1.018)
42	Divorced, Widowed or Prefer		-0.328		0.625
43	not to say		(-2.463 - 1.806)		(0.119 - 3.282)
44	Ethnicity baseline: not an				
45	ethnic minority				
46	Ethnic Minority		-0.378		1.525
47			(-1.353 - 0.598)		(0.642 - 3.626)
48	Prefer not to say		1.621		1.778
49			(-1.272 - 4.515)		(0.159 - 19.85)
49	Location: Rest of the world		-0.0235		1.076
50	(baseline: UK)				
51			(-0.916 - 0.869)		(0.496 - 2.332)
52					
53					
54	Constant	6.087***	7.774***		
55		(5.355 - 6.818)	(6.420 - 9.128)		
56					
57	Observations	310	310	310	310
58	R-squared	0.147	0.263		
59	1	*** p<0.01, ** p<0.05, * p<0.1; B: Regression coefficient; O.R: Odds Ratio; CI: Confidence			
60	2	Interval			

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For peer review only



Supplementary Materials

Supplementary Table 1 – Further breakdown of respondents' identities

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	0	0	1	0	0	1
Gay/Lesbian	71	93	2	2	17	185
Bisexual	42	5	4	3	12	66
Queer	8	5	3	1	8	25
Asexual	3	0	0	1	5	9
Identify with another sexuality	6	1	2	0	8	17
Prefer not to say	0	2	1	0	3	6
Don't Know	1	0	0	0	0	1
Total	131	106	13	7	53	310

Supplementary Table 2 – Further breakdown of respondents' identities and mean PSS scores (standard deviation in brackets)

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	/	/	/	/	/	/
Gay/Lesbian	6.43 (3.18)	7.03 (2.97)	/	/	7.71 (3.51)	6.92 (3.11)
Bisexual	8.36 (3.27)	9.20 (3.70)	/	/	9.33 (2.93)	6.00 (3.31)
Queer	9.00 (2.00)	8.8 (3.27)	/	/	10.38 (1.77)	9.36 (2.58)
Asexual	/	/	/	/	10.00 (2.24)	9.78 (1.92)
Identify with another sexuality	7.67 (3.33)	/	/	/	9.88 (2.59)	8.88 (2.85)

Prefer not to say	/	/	/	/	/	9.00 (3.27)
Don't Know	/	/	/	/	/	/
Total	7.31 (3.29)	7.27 (3.07)	8.46 (3.31)	9.00 (2.94)	9.08 (2.97)	7.68 (3.22)

Notes: values for cells with less than 5 respondents suppressed

Supplementary Table 3 – Further breakdown of respondents' identities and proportion with CESD-D-10 scores suggesting significant depressive symptomology

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	/	/	/	/	/	/
Gay/Lesbian	63.4%	61.3%	/	/	82.4%	64.3%
Bisexual	80.9%	80.0%	/	/	91.7%	80.3%
Queer	100.0%	100.0%	/	/	87.5%	96.0%
Asexual	/	/	/	/	100.0%	100.0%
Identify with another sexuality	66.7%	100.0%	/	/	75.0%	70.6%
Prefer not to say	/	/	/	/	/	83.3%
Don't Know	/	/	/	/	/	/
Total	71.8%	64.2%	76.9%	71.4%	86.8%	71.9%

Notes: values for cells with less than 5 respondents suppressed

Supplementary Table 4 – Continuous model estimates of CES-D-10

	Unadjusted B(SE)	Adjusted B(SE)
Any harassment or inappropriate incidents baseline:		
None		

1			
2			
3	Form of harassment reported	3.875***	2.700**
4		(1.852 - 5.899)	(0.644 - 4.756)
5	No information	0.257	-0.623
6		(-2.992 - 3.507)	(-3.852 - 2.606)
7			
8	Gender ID and Sex Orientation baseline: Cis female		
9	Gay/Lesbian		
10			
11	Cis female of another non-heterosexual orientation	3.249***	2.132*
12		(0.981 - 5.518)	(-0.156 - 4.420)
13	Transgender and gender diverse	4.797***	3.383***
14		(2.636 - 6.958)	(1.164 - 5.602)
15	Cis male gay	1.226	1.027
16		(-0.824 - 3.276)	(-1.020 - 3.074)
17	Cis male of another non-heterosexual orientation	4.336**	2.781
18		(0.435 - 8.238)	(-1.087 - 6.648)
19			
20	Age group baseline: 18-24 years		
21	25-34 years		-1.932
22			(-4.299 - 0.436)
23	35-44 years		-2.899**
24			(-5.359 - -0.439)
25	45-54 years		-4.453***
26			(-7.080 - -1.826)
27	55+ years		-3.974**
28			(-7.385 - -0.564)
29			
30			
31	Change in social status since pandemic baseline:		
32	positive change		
33	Negative change in status		2.649***
34			(0.641 - 4.658)
35	No change		0.746
36			(-1.061 - 2.554)
37			
38	Relationship status baseline: Single		
39	Dating or in a relationship but not living together		0.440
40			(-1.591 - 2.472)
41	Cohabiting/Married/Civil Partner		-1.979**
42			(-3.831 - -0.127)
43	Divorced, Widowed or Prefer not to say		0.416
44			(-4.364 - 5.196)
45			
46	Ethnicity baseline: not an ethnic minority		
47	Ethnic Minority		0.404
48			(-1.780 - 2.587)
49	Prefer not to say		1.076
50			(-5.403 - 7.556)
51	Location: Rest of the world (baseline: UK)		-0.0193
52			(-2.018 - 1.980)
53			
54			
55			
56	Constant	11.22***	14.31***
57		(9.622 - 12.82)	(11.28 - 17.34)
58			
59	Observations	310	310
60			

R-squared	0.126	0.208
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*** p<0.01, ** p<0.05, * p<0.1

Supplementary materials – further notes on measures of harassment and discrimination

Respondents were asked:

Since the start of the coronavirus pandemic, have you experienced any of the following in your day-to-day life (going to the shops, walking around the neighbourhood, etc...) because you are LGBTQ+ or others thought you were LGBTQ+?

- verbal harassment, insults or other hurtful comments;
- physical harassment or violence;
- sexual harassment or violence;
- threat of physical or sexual harassment or violence;
- exclusion from events or activities;
- someone disclosing that you are LGBTQ+ to others without your permission;
- any other inappropriate comments or conduct not listed above (please state).
- None

Respondents were free to select multiple options in terms of forms of discrimination.

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	4	Present key elements of study design early in the paper	7-10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	10- 12,19
Study size	10	Explain how the study size was arrived at	7-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-12
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-12
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	10-12
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	8
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	12
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	12, 25- 26
		(b) Indicate number of participants with missing data for each variable of interest	12
Outcome data	15*	Report numbers of outcome events or summary measures	12, 25- 26

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Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-15, 26-28
		(b) Report category boundaries when continuous variables were categorized	12-15, 26-28
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	15-17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17-20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Discrimination as a predictor of mental health issues among LGBTQ+ people during the COVID-19 pandemic: cross-sectional analysis of the online Queerantime Study

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Discrimination as a predictor of mental health issues among LGBTQ+ people during the COVID-19 pandemic: cross-sectional analysis of the online Queerantime Study

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Abstract

Objectives: To assess the mental health and experiences of discrimination amongst Lesbian, Gay, Bisexual, Transgender, Queer people (LGBTQ) at the start of the COVID-19 pandemic.

Design: Data come from a cross-sectional online survey targeted at LGBTQ+ people, which collected data on mental health, experiences of discrimination, and a number of other pandemic-related experiences. To examine the association between sexual orientation and gender, and mental health and experiences of discrimination, we conducted regression analyses that adjusted for a range of sociodemographic variables.

Setting: A web-based survey was used to collect data between the end of April and mid-July 2020.

Participants: An analytical sample of 310 LGBTQ+ respondents aged 18 and over.

Main outcome measures: We assessed mental health with the 4-item Perceived Stress Scale (PSS-4), and with the 10-item Center for Epidemiological Studies Depression scale (CES-D-10). We asked respondents about discriminatory experiences because of their LGBTQ+ identity during the coronavirus pandemic.

Results: Perceived stress scores among our LGBTQ+ sample were high (Mean: 7.67; Standard Deviation: 3.22). Based on a score of ten or over on the CES-D-10, the majority of participants had high levels of depressive symptoms (72%). Around one-in-six respondents reported some form of discrimination since the start of the pandemic because they were LGBTQ+ (16.7%). The average score for perceived stress increased by 1.44 points (95% Confidence Interval (CI): 0.517-2.354) for respondents who had experienced discrimination versus those who had not. Similarly, the odds of exhibiting significant depressive symptomology increased three-fold among those who had experienced discrimination compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052).

Conclusions: The LGBTQ+ community exhibited increased levels of depression, stress, and experienced discrimination during the coronavirus pandemic. Increased levels of poor mental health were partially explained by experiences of discrimination which had a large, consistent and pernicious impact on mental health.

Keywords: COVID-19; LGBTQ+; mental health; stress; discrimination.

Article summary – strengths and limitations of this study

- This study uses tools that have been validated among diverse populations to identify high levels of perceived stress and depressive symptoms among LGBTQ+ people.
- An online convenience sample was deemed appropriate for a number of reasons including the inherent risk of transmission of COVID-19 with methods involving physical contact and to better include respondents who were sheltering or shielding in households where their LGBTQ+ status was concealed .
- An online convenience sample can introduce issues around representativeness and the possibility that those with greater mental health issues self-selected into the survey.
- Due to relatively small sample sizes, we have not been able to fully examine the diversity of the LGBTQ+ community.
- Designing a survey that captured LGBTQ+ specific experiences allowed us to identify that sexuality- and gender-based discrimination experienced during the pandemic is an important predictor of mental health issues.

1 Introduction

2 The coronavirus pandemic has exposed and magnified existent societal and health inequities
3 operating across multiple and intersecting systems of oppression.^{1 2} Given documented stark
4 health and socioeconomic inequalities across social locations related to sexuality, and gender
5 expression and identity,³ the coronavirus disease (COVID-19) and subsequent social and
6 economic implications could be expected to have disproportionate impacts on Lesbian, Gay,
7 Bisexual, Transgender, and Queer people (LGBTQ+, the “plus” including those who identify
8 as non-heterosexual and/or non-cisgender in another way).

9
10 Higher levels of pre-existing health conditions compared to cisgender and heterosexual
11 populations, may place the LGBTQ+ community at additional risk of adverse prognosis if
12 diagnosed with COVID-19. This includes long-term chronic illness, and higher rates of
13 smoking and asthma among LGBTQ+ people;⁴⁻⁷ higher rates of obesity, and alcohol
14 consumption among lesbian, bisexual, and queer women;⁷⁻⁹ and increased likelihood of
15 being immunocompromised (e.g. HIV+ with a low CD4 cell count or with untreated HIV)
16 among gay men and transgender people.¹⁰ In addition, the impacts of social distancing and
17 lockdown may be felt acutely by LGBTQ+ people, who were at greater risk of poorer mental
18 health prior to the pandemic including higher risks of suicide attempts and suicidal ideation,
19 higher levels of common mental disorders, and lower levels of mental wellbeing.^{11 12 13} For
20 example, studies using the 4-item Perceived Stress Score (PSS-4), a measure used in the
21 present study (see methods), have found mean values have ranged between 6.75 and 7.43 for
22 US college students who identified as ‘homosexual’ and bisexual respectively, compared to
23 6.09 among heterosexual students.¹⁴ Similarly, studies examining depression using the
24 Center for Epidemiological Studies Depression Scale (CES-D-10), a measure of depressive
25 symptomatology used in the present study (see methods), have found that the proportion

1 reporting substantial depressive symptomology among African American LGB young people
2 to stand at roughly double that of heterosexual young people in the southern United States
3 (56.1% vs 28.4%).¹⁵ Comparative data on LGBTQ+ experiences during the pandemic are
4 rare, although in the UK general population the average stress score (using the PSS-4 scale)
5 was estimated to be 6.48 (Standard Deviation: 3.3),¹⁶ above a 6-point threshold used to
6 indicate 'high' levels of stress elsewhere.¹⁷ Estimates within the general (US) population
7 during the COVID-19 pandemic have suggested that up to a third of people may be
8 experiencing substantial depressive symptomology (using the CES-D-10 scale).¹⁸

9
10 Within the heterogeneous LGBTQ+ umbrella term, individual groups may be positioned at a
11 distinct disadvantage. Transgender and gender-diverse (TGGD) individuals have a gender
12 that differs from the culturally-bound gender associated with one's assigned birth.¹⁹ TGGD
13 people are known to experience higher rates of adverse mental health compared to cisgender
14 individuals (people whose gender matches their sex assigned at birth), particularly anxiety,
15 depression, and suicidality.^{5 6 20}

16
17 Despite the accumulation of evidence indicating poorer health among LGBTQ+ people
18 predating the pandemic, there is a dearth of information on whether the hypothesised
19 additional risks outlined above have actually materialised in poorer outcomes among
20 LGBTQ+ people during the COVID-19 pandemic. Indicative evidence suggests that some
21 LGBTQ+ groups may exhibit higher levels of depression and stress during the COVID-19
22 pandemic²¹ and other studies suggest that mental health among LGBTQ+ people may have
23 deteriorated during the pandemic compared to pre-pandemic levels.²² However, while some
24 studies indicate that LGBTQ+ people may be more susceptible to stress and depression
25 during the COVID-19 pandemic, this has been largely attributed to existing inequalities in

1
2
3 1 mental health status, with differences attenuating once pre-pandemic levels of mental health
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5 2 are accounted for ²¹. In other words, although absolute differences in mental health status
6
7 3 may be observed, there are few differences between the way in which LGBTQ+ and
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10 4 cisgender-heterosexual people's mental health changed during the pandemic ²³. The findings
11
12 5 from these studies are a cause of concern in of themselves, given that the lockdown entailed a
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14 6 separation from social networks and formal support that could help people in managing
15
16 7 mental health issues. However these studies, which drew on samples of both LGBTQ+ and
17
18 8 cisgender-heterosexual respondents, did not account for other risk factors for mental health
19
20 9 that may have continued and intensified in potency during the pandemic and resulting
21
22 10 lockdown for LGBTQ+ people. Mental health inequalities during and predating the pandemic
23
24 11 are a product of complex processes of discrimination and exclusion ^{24 25}, and examinations of
25
26 12 LGBTQ+ mental health that do not examine these process may provide an incomplete
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28 13 understanding of how LGBTQ+ people have fared during the pandemic.
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31 14 Certainly, LGBTQ+ people face stressors during the pandemic that are not shared with
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33 15 heterosexual and cisgender people, including spending periods of 'lockdown' in households
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35 16 that are not affirming or supportive of their sexual orientation or gender identity or
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37 17 expression, ²⁶ being separated from social networks that are supportive and affirming to their
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39 18 identity, ^{27 28} and interruptions to accessing gender affirming care among transgender and
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41 19 gender non-binary people ^{29 30}. Theoretical frameworks including the Minority Stress Model
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43 20 suggest that stark health inequalities are the result of distal and proximal stressors caused by
44
45 21 living within a homophobic, heterosexist, transphobic culture, results in cumulative
46
47 22 experiences of discrimination, harassment, victimization, expectations of rejection, and
48
49 23 internalized transphobia and homophobia. ^{24 25} These experiences have been extensively
50
51 24 documented across several studies, where high prevalence of experiences of stigma and
52
53 25 discrimination has been reported among the LGBTQ+ community. ^{31 32} During the pandemic,
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1 experiences of discrimination may have become magnified because, as described above,
2 LGBTQ+ people may have been sheltering in households that were unsupportive or hostile
3 towards their identities,²⁶ or have not received support from networks and relevant
4 organisations. In some contexts, the pandemic has triggered a rise in hate speech and targeted
5 attacks on the LGBTQ+ community, and members of the LGBTQ+ community have been
6 blamed for the very emergence of the virus.³³ Unrelated to the coronavirus itself, the
7 lockdown coincided with online debates around sex and gender, which have manifested in
8 transphobic comments made and supported by high profile figures, and a hostile online
9 environment for many transgender people.³⁴ These attacks occurred at a time when many in
10 the community were unable to draw on their usual support networks.

11
12 In the context of the coronavirus pandemic where existent inequalities are being exacerbated
13 across social locations,² it is paramount to document how the LGBTQ+ community has fared
14 during the initial stages of the coronavirus pandemic. The present study aims to address this
15 need through analysing data from the Queerantime Study (a portmanteau Queer and
16 Quarantine), a web-based survey that assesses how LGBTQ+ adults are experiencing the
17 coronavirus pandemic. In the present paper, we examine extent to which respondents to the
18 Queerantime survey experienced forms of sexuality or gender-based discrimination, including
19 harassment and exclusion, during the coronavirus pandemic. We also examine how
20 widespread experiences of perceived stress and depressive symptomology were among
21 respondents to the Queerantime survey and examine to what extent instances of harassment
22 and exclusion predict poorer mental health among LGBTQ+ respondents during the
23 coronavirus pandemic.

24

1 **Methods**

2 Data collection was conducted via a cross-sectional, web-based anonymous survey. It began
3 on 27th April 2020 and ended on 30th December 2020.. Twitter, Facebook and Instagram
4 accounts were created for the study and were used to disseminate links to the survey in order
5 to maximise the response rate. We contributed guest blogs and created a website in order to
6 help publicise the study (<https://queerantinestudy.wixsite.com/queerantine>). The link to the
7 survey was distributed through a number of LGBTQ+ organisations including through the
8 newsletter of the LGBT Consortium, the largest network of LGBT+ groups, projects and
9 organisations in the UK, as well as directly by local organisations such as the East London
10 Out Project (ELOP). The target sample included respondents aged 18 and over, and who self-
11 identify as lesbian, gay, bisexual, queer, as having another minority sexual orientation; or
12 who were transgender or gender diverse in other ways including being non-binary or intersex.
13 Cisgender respondents who self-identify as heterosexual were not excluded from the survey,
14 although recruitment and survey design were tailored towards the LGBTQ+ community, and
15 their responses were not included in the analyses presented here. The Queerantine survey
16 asked respondents about their sociodemographic characteristics, their physical and mental
17 health, health behaviours, and experiences and anxieties relating to the pandemic and their
18 identity. Ethical approval was obtained from the ethics board of the University of Sussex
19 (ER/LB516/4) and University College London (REC 1335).

21 **Patient and Public Involvement**

22 Expert input from a representative of a national LGBT umbrella organisation broadened the
23 focus of the survey to consider how respondents had experienced changes in support from
24 LGBTQ+ service providers and organisations; this input also helped to shape the measures
25 around gender. Community organisations also helped in the dissemination of the study

1 through social media and inclusion of the study within newsletters. However, no further
2 public involvement was sought in the design or analysis of the survey.

4 **Outcome variables**

5 In this analysis we focus on three outcomes: depressive symptoms, perceived stress, and
6 experiences of discrimination. We assessed depression with the 10-item Center for
7 Epidemiological Studies Depression Scale (CES-D-10), which asks respondents to consider
8 how much in the past week they have experienced feelings of loneliness, happiness, and fear.
9 ³⁵ The CES-D-10 includes three items on depressed affect, five items on somatic symptoms,
10 and two on positive affect. ³⁶ Scores range between 0 and 30 with good levels of internal
11 consistency in our analytical sample (Cronbach's $\alpha=0.87$). Thresholds were used to denote
12 significant depressive symptoms' based on a score of ten or over ³⁵. In the present study we
13 mainly examine the CES-D-10 as a binary measure, with supplementary analyses presenting
14 data on CES-D-10 in continuous models.

15 We measured stress with the 4-item Perceived Stress Scale (PSS-4), which assesses the extent
16 to which situations in life are viewed as stressful. ³⁷ The scale asks respondents about
17 respondents' perceived ability to control important things in life, confidence in handling
18 personal problems, the extent to which they felt things were going their way, and whether
19 difficulties were piling up so high they were becoming insurmountable, using the past month
20 as a frame of reference. Scores range between 0 and 15, and have good levels of internal
21 consistency in our analytical sample (Cronbach's $\alpha=0.83$).

22
23 We measured experiences of discrimination with a set of options that asked respondents
24 whether, since the start of the coronavirus pandemic, they had experienced verbal
25 harassment, physical harassment, sexual harassment, threats of violence, exclusion from

1 events/activities, involuntary disclosure of LGBTQ+ identity, or other forms of inappropriate
2 treatment because they were LGBTQ+ or were perceived as being LGBTQ+. Individual
3 measures were combined into one summary variable of ‘any discrimination.’

4 5 **Sexual orientation and gender**

6 Gender was assessed using the recommended two-step method ³⁸ with two items: (1) the
7 gender that participants felt best represented them (options included: Female (including trans
8 woman); Male (including trans man); Non-binary; Other (free text category)), and (2)
9 whether this gender was the same as assigned at birth (options included: Yes; No; Don’t
10 Know). The two items were cross-tabulated to categorise participants as either transgender
11 and gender diverse (TGGD) or cisgender. Sexual orientation was captured with a question
12 that asked participants to select their sexual orientation from the following categories:
13 Bisexual; Gay/Lesbian; Heterosexual/Straight; Don’t know; Prefer not to say; and an Other,
14 free-text category. Using pre-defined response categories, respondents could only select one
15 category, although those who identified with multiple categories (e.g. Queer and Bisexual or
16 Male and Non-binary) could use the free-text option to state this, with respondents declaring
17 more than one gender being categorised as transgender and gender diverse, and respondents
18 selecting more than one sexual orientation categorised as having another non-heterosexual
19 orientation.

20
21 We present data on sexual orientation and gender as different constructs in supplementary
22 analyses, although the main analyses use a variable that examines the intersection of sexual
23 orientation and gender using five categories: (i) cisgender female lesbian/gay; (2) cisgender
24 female with another non-heterosexual orientation (including bisexual, other, don’t know, and
25 prefer not to say); (3) transgender and gender diverse; (4) cisgender male gay; (5) cisgender

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3 1 male with another non-heterosexual orientation (including bisexual, other, don't know, and
4
5 2 prefer not to say).
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10 4 **Covariates**

12 5 We adjusted for variables thought to confound the association between our exposure and
13
14 6 outcome variables. Socioeconomic status was measured through a variable that asked
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16 7 respondents about their subjective social status (modelled on an approach used in general
17
18 8 population surveys ³⁹), and how this had changed since the start of the pandemic, with
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20 9 categories reflecting no change, positive change, and negative change.
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26 11 **Analytical plan**

28 12 Data for the present analyses includes responses collected until 13 July 2020. The analysis
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30 13 mainly consisted of a complete case analysis of respondents, although a dummy category of
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32 14 no information (missing) for the harassment variable was created for models of mental health
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34 15 in order to preserve sample size. Summary statistics were calculated for baseline
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36 16 characteristics and associations between exposure variables and outcomes were tested in
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38 17 unadjusted analyses using the χ^2 test of association and ANOVA as appropriate. The
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40 18 modelling began with exploring selected predictors of discrimination before examining how
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42 19 discrimination itself predicted poorer mental health. Binary logistic regression models were
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44 20 constructed for harassment and high depressive symptomology; Ordinary Least Squares
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46 21 (OLS) regression models were constructed for continuous models of perceived stress and
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48 22 depressive symptoms. Results for both binary and continuous specifications of CES-D-10 are
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50 23 discussed, with the results for the continuous specification included in supplementary
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52 24 analyses, as a form of sensitivity analysis. For models where discrimination is the outcome of
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54 25 interest we only adjusted for sexual orientation and gender, age, ethnicity, and location. For
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3 1 models where depressive symptomology or perceived stress are the outcomes of interest, we
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5 2 used the measure of discrimination as the main exposure variable, and adjusted for the same
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7 3 covariates as above as well socioeconomic status and relationship status. A different set of
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9 4 controls was used between models as the potential confounders were theorised to differ
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11 5 slightly and due to the lower number of ‘events’ in the model of discrimination.
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13 6 Additional analysis examining when in the pandemic harassment and discrimination occurred
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15 7 is also included to contextualise the discussion. Adjusted and unadjusted models are
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17 8 presented, and in line with suggested practice, estimates were evaluated based the exact p-
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19 9 value, the magnitude of the coefficients and the width of the confidence intervals, rather than
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21 10 on a single test statistic.⁴⁰ We conducted all analyses in Stata 14.⁴¹ The decision on how to
22
23 11 present the findings across diverse identities is challenging, particularly as we combined
24
25 12 information on sexual orientation and gender in deriving categories. Our decisions reflected
26
27 13 considerations of the conceptual similarities/differences between groups, the numbers across
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29 14 groups within our sample, as well as the decision to adopt an ‘inclusive’ or ‘specific’
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31 15 approach⁴² when analysing the data based on observed differences in key variables. Some
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33 16 preliminary analysis (not shown) was undertaken to explore the validity of bringing different
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35 17 groupings together before the decision was taken to use five main categories combining
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37 18 sexual orientation and gender.
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20 **Results**

21 Between April 27th and July 13th we received a total of 426 responses. Of these 24 were
22 excluded because they did not provide their age, and 4 were excluded because they were aged
23 under 18. Of the remaining 398, we were able to calculate PSS-4 and CES-D-10 scores for
24 325 and 324 respondents respectively. Once we had accounted for missingness on other

1 covariates, the analytical sample consisted of 310 respondents for models of mental health,
2 excluding one further cisgender heterosexual respondent.

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10 *TABLE 1 HERE*
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15 6 Participants identified their sexual orientation and gender in a number of different ways. The
16
17 7 largest group identified as cisgender gay males (30.0%); almost a quarter of the sample
18
19 8 (23.5%) were categorised as TGGD (of different sexual orientations); cisgender gay and
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21 9 lesbian females comprised 22.9% of the respondents; while cisgender females with another
22
23
24 10 non-heterosexual orientation accounted for 19.4% of respondents, and cisgender males with
25
26 11 another non-heterosexual orientation accounted for 4.2% of respondents. A further
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28
29 12 breakdown of respondents' identities is available in the supplementary file, with descriptive
30
31 13 information on key variables. Respondents aged 18-24 accounted for less than a fifth of the
32
33 14 sample (15.1%), while those aged 55+ accounted for less than a tenth of the sample (7.1%),
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35 15 with a greater representation of respondents aged 25-54 years old.

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37
38 16 Descriptively, the mean scores for PSS-4 suggested that the sample had high levels of
39
40 17 perceived stress (Mean (M): 7.67; Standard Deviation (SD): 3.22). Using the recommended
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42 18 threshold of 10 or more to identify significant depressive symptomatology, we observed that
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44 19 the majority of respondents fell into this category (71.9%). Cis-female respondents who
45
46 20 identify as gay or lesbian had the lowest scores for perceived stress or depressive symptoms
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49 21 (see Table 1); conversely transgender and gender diverse individuals had the highest scores
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51 22 (83.6%).
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56 24 One-in-six respondents reported some form of harassment since the start of the pandemic
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58 25 because they were LGBTQ+ (16.7%); the most common forms being verbal harassment
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1 including insults or other hurtful comments (8.7%), exclusion from events or activities
2 (5.6%), and involuntary disclosure of LGBTQ+ identity (3.5%). Perceived stress was
3 markedly higher for those who had experienced discrimination (PSS-4 M: 9.44 SD: 2.99)
4 compared to those who had not (PSS-4 M: 7.35 SD: 3.16). Respondents who had experienced
5 discrimination also had higher depressive symptomology scores (CES-D-10 M: 17.87 SD:
6 6.21) compared to those who had not (CES-D-10 M: 13.43 SD: 6.97).
7

8 *TABLE 2 HERE*
9

10 We examined the relationship between gender and sexual orientation and discrimination in
11 logistic regression models (see Table 2). Based on the association observed in Table 1, we
12 used TGGD as the reference category and explored whether the higher risk of TGGD people
13 to experience discrimination remained after controlling for basic sociodemographic
14 covariates. The results from adjusted models showed that the odds of experiencing
15 discrimination were lower for all other groups, and significantly lower in the case of
16 cisgender gay males (OR: 0.237, 95% Confidence Interval (CI):0.091-0.617) and cisgender
17 females who identified with a sexual minority orientation other than gay/lesbian (OR: 0.361,
18 CI: 0.141-0.921). Within the sample, the results were suggestive of a u-shaped trend in terms
19 of age, with the youngest and the oldest LGBTQ+ respondents in the sample being at greatest
20 risk of experiencing discrimination, although differences by age were generally not
21 statistically significant.
22

23 Experiences of discrimination were clear predictors of poorer mental health. The average
24 score for perceived stress increased by 1.44 points (CI: 0.517-2.354) for those who had
25 experienced discrimination, compared to those who had not. Similarly, the odds of exhibiting

1 significant depressive symptomology (CES-D-10 scores of 10 or more) increased three-fold
2 among those who had experienced discrimination based on their gender or sexuality
3 compared to those who had not (OR: 3.251; 95% CI: 1.168-9.052). These marked
4 associations remained after adjusting for potential confounders (see Models 1 to 4 in Table
5 3).

6
7 *TABLE 3 HERE*

8
9 Cisgender female lesbian or gay respondents had lower perceived stress levels than other
10 LGBTQ+ groups. TGGD respondents and non-heterosexual cisgender males who didn't
11 identify as gay had among the highest average perceived stress scores in adjusted models.
12 Although similar trends were observed in the odds of experiencing depressive
13 symptomatology, the evidence was ultimately inconclusive for these groups, although
14 cisgender females with another non-heterosexual orientation besides lesbian or gay had a
15 higher risk of significant depressive symptoms relative lesbian/gay cisgender women. Further
16 sensitivity analysis of the CES-D-10 as a continuous measure (see supplementary file) shows
17 that TGGD people had substantially higher CES-D-10 scores than cisgender lesbian or gay
18 females, with an average score 3.38 points (95% CI: 1.172-5.595) higher after adjusting for
19 other covariates. A clear trend by age was observed in models 3 and 4 (see Table 3), with
20 younger respondents having significantly poorer mental health than older individuals, both
21 for perceived stress and significant depressive symptomology, after adjusting for other
22 covariates.

23 24 **Discussion** 25

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3 1 In this study we present data on the levels of depressive symptoms, perceived stress, and
4
5 2 experiences of discrimination of LGBTQ+ people during the COVID-19 pandemic collected
6
7 3 through a web-based survey. Respondent characteristics broadly mirrored the
8
9 4 sociodemographic characteristics of the recent UK government National LGBT Survey.⁴³
10
11 5 The distribution of respondents by sexual orientation was very similar, albeit with a higher
12
13 6 share of respondents who identified as Queer in the Queerantime survey (8% vs
14
15 7 approximately 1%). The proportion of respondents aged 18-24 was lower at 15.1%
16
17 8 (compared with approximately 37.4%), with higher proportions at older age groups in line
18
19 9 with the UK population as a whole. The Queerantime survey had a larger proportion of
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21 10 participants who were TGGD than the UK National LGBT Survey (23.5% vs 15%).⁴³
22
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24
25 12 We find that scores for perceived stress and depressive symptoms among our LGBTQ+
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27 13 sample are high, and higher than observed in community samples and vulnerable populations
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29 14 in the recent past (for example^{44 45}). Furthermore, we find that the pandemic may not be
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31 15 impacting the LGBTQ+ community evenly, with TGGD individuals having particularly high
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33 16 scores for perceived stress and depressive symptoms relative to cisgender gay and lesbian
34
35 17 individuals. Non-heterosexual respondents who are cisgender but do not identify as lesbian or
36
37 18 gay also had elevated scores for perceived stress and depressive symptoms. Similarly, there
38
39 19 was a clear age gradient with younger LGBTQ+ people having much higher risks of showing
40
41 20 symptoms of stress and depression. This is in line with findings elsewhere that suggest
42
43 21 younger people were at elevated risk of experiencing stress, anxiety and depression during
44
45 22 the pandemic.⁴⁶ An important caveat to these results is that because of our cross-sectional
46
47 23 design, we are unable to definitively state that mental health status *deteriorated* as a result of
48
49 24 the pandemic and whether any deterioration in mental health was concentrated among TGGD
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51 25 respondents or younger respondents; our study design also means we are unable to make
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1 direct comparisons to ascertain whether LGBTQ+ people are faring worse during the
2 pandemic than heterosexual cisgender people. However, the underlying pathways through
3 which LGBTQ+ people may have experienced greater and specific challenges during the
4 pandemic and lockdown are becoming evident,^{22 26-30} providing a basis for an assumption
5 that LGBTQ+ people may have experienced greater stressors, with TGGD people facing
6 particular sets of stressors, albeit on a theoretical basis and in need of further exploration and
7 verification. Furthermore the very high levels of mental health issues uncovered here make it
8 challenging to simply attribute such stark levels of mental health issues as the status quo pre-
9 pandemic, although this assumption again needs further exploration and verification using a
10 different study design. Regardless, the data definitively show that the pandemic has had a
11 pernicious effect on the mental health of the LGBTQ+ community.

12
13 Our analyses of discrimination reinforce the rationale for undertaking analyses of LGBTQ+
14 health and mental health, with LGBTQ+ people theorised at greater risk of health
15 complications due to a unique set of internal and external homophobic, heteronormative, and
16 transphobic stressors.⁴⁷ We found that almost one-in-six respondents reported experiencing
17 some form of discrimination during the pandemic, with TGGD respondents again at
18 heightened risk of experiencing discrimination relative to other LGBTQ+ groups. Our results
19 show that experiencing discrimination was a risk factor for higher perceived stress and
20 depressive symptomology; the odds of reporting depressive symptomatology among
21 individuals who had experienced discrimination were three times higher than among
22 individuals who had not experienced any discrimination. Open ended responses to the survey
23 described various experiences of discrimination and inappropriate incidents including
24 increased or excessive scrutiny, misgendering, exclusion, and online abuse.

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3 1 To further understand the results, we explored how mental health and discrimination varied
4
5 2 over the course of the survey. We observed that mental health scores in the sample were
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7 3 poorer during the period April 27th-May 10th (the moment of ‘maximum risk’ as defined by
8
9 4 the UK Prime Minister) and during the period between May 23rd-June 14th (coinciding with
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11 5 revelations of lockdown breaches by government officials in the UK, transphobic comments
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13 6 on social media made by high profile figures, and protests surrounding the murder of George
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15 7 Floyd), although these differences were not significant. Similarly, we observed non-
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17 8 statistically significant differences in the proportion of respondents reporting instances of
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19 9 discrimination, with the initial easing of the lockdown and particularly the period from June
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21 10 15th onwards coinciding with increases in discrimination (see Figure 1), albeit based on a
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23 11 small sample in the latter period. These trends help contextualise the results and illuminate
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25 12 the hostile environments which LGBTQ+ people, and particularly TGGD respondents, were
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27 13 experiencing.
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35 15 *FIGURE 1 HERE*
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39 17 **Limitations**

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41 18 Due to relatively small sample sizes, we have not been able to fully examine the diversity of
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43 19 the LGBTQ+ community, and fully examine how experiences vary according to social
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45 20 locations such as ethnicity, age, and gender. Studies in the US show that the highest levels of
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47 21 violence are reported among transgender women of colour, and among young and low-
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49 22 income transgender people,^{31 32} suggesting that violence on the basis of transgender identity
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51 23 or expression often affects the most marginalised subpopulations. Although we have adjusted
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53 24 for these factors in our models, we have not been able to further disaggregate across social
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55 25 locations to examine the role of interlocking systems of oppression in patterning experiences
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57 26 of discrimination and adverse mental health.
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5 2 While our data collection efforts are limited by the inherent challenge of surveying a small,
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7 3 dispersed, diverse, and difficult to reach population, it is nonetheless critically important to
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9 4 study the lives and experiences of discrimination and mental health among LGBTQ+
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11 5 communities because of the stark health and social inequalities they experienced before the
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13 6 pandemic. Our choice of mental health measures reflected the need to field short scales
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15 7 within a web-based survey where there was no incentive provided for respondents to
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17 8 complete the questions. However, other more comprehensive or alternative measures of
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19 9 mental health, and particularly mental wellbeing, may have yielded further nuance to the
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21 10 results presented here.
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12 New purposeful data collection was deemed appropriate as although a number of large
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14 representative studies (e.g. the UK Household Longitudinal Study) are currently collecting
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16 data on COVID-19 experiences, they typically contain small numbers of LGBTQ+ people,⁸
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18 ¹² often do not collect information on TGGD identities, and contain heteronormative
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20 measures that can be exclusionary to LGBTQ+ respondents. An online convenience sample
21
22 was deemed appropriate due to the absence of robust data on LGBTQ+ people from large
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24 surveys that could help to determine the characteristics of a representative sample of
25
26 LGBTQ+ people, as well as the risks inherent with any form of physical data collection
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28 during the pandemic. An online approach was particularly suitable for those respondents who
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30 may have been sheltering or shielding in households where their LGBTQ+ status was
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32 unknown to other members of the household. Furthermore, this approach is in line with other
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34 recent large scale efforts at understanding the health of LGBT people in the UK.⁴³ We do,
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36 nevertheless, acknowledge that an online convenience sample can introduce potential issues
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38 around sample selection, such as the omission of those without internet access, and the
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1 possibility that those living in stressful situations or with depressive symptoms were more
2 likely to self-select into the survey. Although rudimentary checks for data patterns that could
3 indicate that ‘bots’ completed the survey were implemented, focussed on identifying cases
4 where the same response had been provided to all Likert scale type questions, or where the
5 middle response had been consistently provided, there remains a possibility that some
6 responses may be based on false or duplicate records. Further measures that could have been
7 implemented, such as password protection or identity checking, were not congruent with a
8 format that allowed respondents to complete the survey anonymously, or believe that they
9 were doing so.

10

11 As the inferential analysis consisted of three regression models where we show the
12 development of the model by including additional regressors, we did not implement
13 additional correction for multiple hypotheses (e.g. Bonferroni). We do note that, given a
14 scenario where 20 hypotheses were being tested at a 5% level, we would expect to see at least
15 one such deviation where we would interpret a result as being ‘statistically significant’
16 inappropriately ⁴⁸; however, as discussed earlier, we also took a broader approach to
17 evaluating estimates than interpreting p-values as being “significant” or “nonsignificant”. ⁴⁰

18

19 **Public Health Implications**

20 Results from the Queerantime Study suggest that groups within LGBTQ+ acronym may be at
21 differential risk of experiencing stress or depressive symptomology, although the sample as a
22 whole may also be at higher risk than the general population of stress and depressive
23 symptomology due to minority stress. Homophobic and transphobic harassment and
24 exclusion experienced during the pandemic has a deleterious impact on LGBTQ+ mental
25 health, demonstrated by the strong and consistent associations between harassment and

1 poorer mental health in the models. Open-ended responses to survey questions emphasise the
2 importance of LGBTQ+ social networks, often facilitated by the work of LGBTQ+
3 organisations, in supporting LGBTQ+ individuals. However, these are the very organisations
4 that are facing financial challenges with many on the brink of closure.⁴⁹

5
6 Globally, LGBT+ rights organisations have alerted policy-makers about the need to address
7 the vulnerability of the LGBTQ+ community to the coronavirus pandemic, including
8 collecting sexual orientation and gender data for COVID-19 cases, increased socioeconomic
9 support for disadvantaged individuals, and support for organisations working with the
10 community.⁵⁰ Our findings provide support to these demands given the documented high
11 prevalence of depressive symptomology and stress, and the concerning reports of experiences
12 of discrimination. Poor LGBTQ+ mental health may remain unchecked without substantial
13 commitment and funding directed to ameliorating health inequalities exacerbated by the
14 pandemic.

16 **Contributors**

17 DK and LB are equal contributors to this study. Both designed the Queerantime survey,
18 developed the research focus, analysed the data, and drafted and edited the manuscript. DK
19 and LB are the guarantors for this study and gave full approval of this version to be
20 published.

22 **Data sharing statement**

23 No additional data are available.

25 **Competing interests**

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2
3 1 None to declare. Due to the nature of this research, participants of this study did not agree for
4
5 2 their data to be shared publicly, so supporting individual level data is not available.
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11
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13
14 6 or not-for-profit sectors.
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18 8 **Ethical approval**

19
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21
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28
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30
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32
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Figure 1 Proportion of respondents reporting discrimination by period in the pandemic

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Tables and Figures

Table 1: Mental health, experiences of discrimination, and sociodemographic characteristics of the Queerantime Study respondents

	Cis female Gay/Lesbian	Cis female of another non- heterosexua l orientation	Trans- gender and Gender Diverse (TGGD)	Cis male Gay	Cis male of another non- heterosexua l orientation	Total
	%	%	%	%	%	%
Mental health outcomes						
PSS-4 Score, M(SD)	6.44 (3.18)	8.33 (3.14)	8.96 (2.99)	7.03 (2.97)	9.00 (3.37)	7.672 (3.218)
CES-D-10 Score, M(SD)	12.0 (6.65)	15.0 (5.86)	17.15 (6.6)	12.75 (7.17)	16.15 (7.5)	14.174 (6.948)
Evidence of significant depressive Symptomology						
No evidence (<10)	36.62	18.33	16.44	38.71	15.38	28.06
Evidence of significant depressive symptomology (≥10)	63.38	81.67	83.56	61.29	84.62	71.94
Any LGBTQ+ related harassment or inappropriate incidents						
None reported	74.65	81.67	64.38	87.10	84.62	77.81
Harassment reported ^s	19.72	13.33	28.77	7.53	15.38	16.72
No information (missing)	5.63	5.00	6.85	5.38	0	5.47
Age Group						
18-24	9.86	18.33	31.51	2.15	30.77	15.11
25-34	18.31	45.00	31.51	32.26	23.08	30.87
35-44	39.44	23.33	16.44	31.18	23.08	27.65
45-54	23.94	10.00	16.44	23.66	15.38	19.29
55+	8.45	3.33	4.11	10.75	7.69	7.07
Identify as ethnic minority						

Not an ethnic minority	87.32	81.67	90.41	83.87	76.92	85.53
Ethnic minority	12.68	16.67	9.59	12.90	23.08	13.18
Prefer Not to Say	0	1.67	0	3.23	0	1.29
Location						
UK	81.69	80.00	82.19	90.32	76.92	83.60
Rest of the world	18.31	20.00	17.81	9.68	23.08	16.40
Change in perceived social status						
Negative change in status	25.35	26.67	36.99	23.66	23.08	27.65
No change	52.11	43.33	35.62	51.61	61.54	46.95
Positive change	22.54	30.00	27.40	24.73	15.38	25.40
Total						100.00
Relationship status						
Single	21.13	25.00	42.47	19.35	23.08	26.37
Dating or in a relationship but not living together	21.13	30.00	19.18	26.88	46.15	25.08
Cohabiting/Married/Civil Partnership	56.34	45.00	34.25	49.46	30.77	45.98
Divorced, Widowed or Prefer Not to Say	1.41	0	4.11	4.30	0	2.57
Total (%)	100.00	100.00	100.00	100.00	100.00	100.00
Total (N)	71	60	73	93	13	310

Notes: M = Mean; SD = Standard Deviation; ^s see methods for types of incidents

Table 2: Logistic regression results for unadjusted and adjusted associations between gender identity/sexual orientation and discrimination during COVID-19 pandemic (Odds ratios and confidence intervals in brackets)

	Experiences of discrimination	
	Unadjusted	Adjusted
	O.R. (CI)	O.R. (CI)
Gender ID and Sex Orientation baseline: Transgender and gender diverse		
Cis female Gay/Lesbian	0.576 (0.265 - 1.252)	0.743 (0.320 - 1.727)
Cis female of another non-heterosexual orientation	0.364** (0.147 - 0.897)	0.361** (0.141 - 0.921)
Cis male gay	0.218*** (0.090 - 0.529)	0.237*** (0.091 - 0.617)
Cis male of another non-heterosexual orientation	0.364 (0.075 - 1.765)	0.334 (0.066 - 1.704)
Age group baseline: 18-24 years		
25-34 years		0.981 (0.411 - 2.347)
35-44 years		0.302**

		(0.102 - 0.896)
45-54 years		0.409
		(0.139 - 1.205)
55+ years		1.567
		(0.474 - 5.188)
Ethnic minority (baseline: not an ethnic minority)		1.345
		(0.520 - 3.484)
Location: Rest of the world (baseline: UK)		0.530
		(0.204 - 1.375)
Observations	295	295

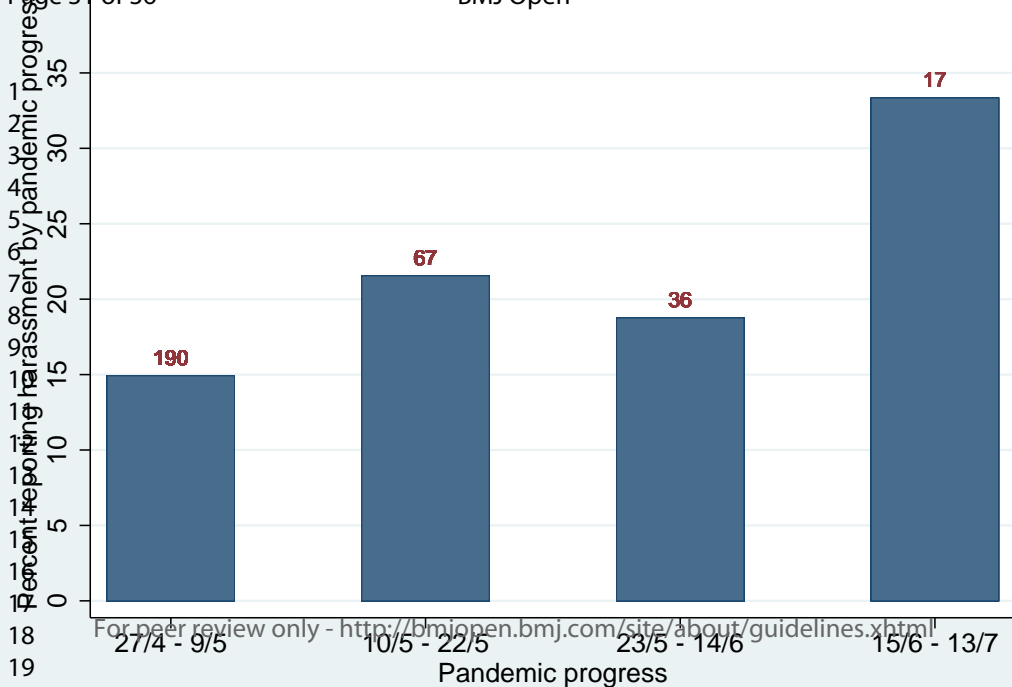
*** p<0.01, ** p<0.05, * p<0.1; O.R: Odds Ratio; CI: Confidence Interval

Table 3: Results of unadjusted and adjusted OLS Regression for PSS-4 score (Models 1 and 2; regression coefficients and confidence intervals in brackets) and unadjusted and adjusted logistic regression results for odds of significant depressive symptomology indicated by CES-D-10 scores ≥ 10 (Models 3 and 4; odds ratios and confidence intervals in brackets)

	PSS-4 score		CES-D-10 scores ≥ 10	
	Unadjusted B(CI)	Adjusted B(CI)	Unadjusted O.R. (CI)	Adjusted O.R. (CI)
Any harassment or inappropriate incidents baseline: None				
Form of harassment reported	1.882*** (0.957 - 2.807)	1.436*** (0.517 - 2.354)	4.228*** (1.582 - 11.30)	3.252** (1.168 - 9.052)
No information	-0.378 (-1.863 - 1.108)	-0.756 (-2.198 - 0.686)	2.325 (0.634 - 8.520)	1.796 (0.456 - 7.074)
Gender ID and Sex Orientation baseline: Cis female Gay/Lesbian				
Cis female of another non-heterosexual orientation	2.014*** (0.977 - 3.052)	1.367*** (0.345 - 2.389)	2.881** (1.257 - 6.604)	2.154* (0.890 - 5.210)
Transgender and gender diverse	2.357*** (1.369 - 3.345)	1.561*** (0.570 - 2.552)	2.748** (1.231 - 6.134)	1.904 (0.791 - 4.580)
Cis male gay	0.824* (-0.113 - 1.761)	0.769* (-0.145 - 1.683)	1.061 (0.550 - 2.046)	0.986 (0.487 - 1.998)
Cis male of another non-heterosexual orientation	2.624*** (0.840 - 4.407)	1.982** (0.255 - 3.709)	3.626 (0.732 - 17.97)	2.553 (0.481 - 13.56)
Age group baseline: 18-24				

years				
25-34 years		-1.070**		0.558
		(-2.127 - -0.0125)		(0.182 - 1.713)
35-44 years		-1.995***		0.480
		(-3.094 - -0.897)		(0.157 - 1.470)
45-54 years		-2.401***		0.309**
		(-3.574 - -1.228)		(0.098 - 0.974)
55+ years		-3.384***		0.361
		(-4.907 - -1.860)		(0.089 - 1.469)
Change in social status since pandemic baseline: positive change				
Negative change in status		1.375***		1.653
		(0.478 - 2.272)		(0.747 - 3.657)
No change		0.217		0.882
		(-0.590 - 1.025)		(0.452 - 1.719)
Relationship status baseline: Single				
Dating or in a relationship but not living together		0.225		0.953
		(-0.682 - 1.132)		(0.410 - 2.211)
Cohabiting/Married/Civil Partner		-0.332		0.499*
		(-1.159 - 0.496)		(0.244 - 1.018)
Divorced, Widowed or Prefer not to say		-0.328		0.625
		(-2.463 - 1.806)		(0.119 - 3.282)
Ethnicity baseline: not an ethnic minority				
Ethnic Minority		-0.378		1.525
		(-1.353 - 0.598)		(0.642 - 3.626)
Prefer not to say		1.621		1.778
		(-1.272 - 4.515)		(0.159 - 19.85)
Location: Rest of the world (baseline: UK)				
		-0.0235		1.076
		(-0.916 - 0.869)		(0.496 - 2.332)
Constant	6.087***	7.774***		
	(5.355 - 6.818)	(6.420 - 9.128)		
Observations	310	310	310	310
R-squared	0.147	0.263		

*** p<0.01, ** p<0.05, * p<0.1; B: Regression coefficient; O.R: Odds Ratio; CI: Confidence Interval



Supplementary Materials

Supplementary Table 1 – Further breakdown of respondents' identities

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	0	0	1	0	0	1
Gay/Lesbian	71	93	2	2	17	185
Bisexual	42	5	4	3	12	66
Queer	8	5	3	1	8	25
Asexual	3	0	0	1	5	9
Identify with another sexuality	6	1	2	0	8	17
Prefer not to say	0	2	1	0	3	6
Don't Know	1	0	0	0	0	1
Total	131	106	13	7	53	310

Supplementary Table 2 – Further breakdown of respondents' identities and mean PSS scores (standard deviation in brackets)

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	/	/	/	/	/	/
Gay/Lesbian	6.43 (3.18)	7.03 (2.97)	/	/	7.71 (3.51)	6.92 (3.11)
Bisexual	8.36 (3.27)	9.20 (3.70)	/	/	9.33 (2.93)	6.00 (3.31)
Queer	9.00 (2.00)	8.8 (3.27)	/	/	10.38 (1.77)	9.36 (2.58)
Asexual	/	/	/	/	10.00 (2.24)	9.78 (1.92)
Identify with another sexuality	7.67 (3.33)	/	/	/	9.88 (2.59)	8.88 (2.85)

Prefer not to say	/	/	/	/	/	9.00 (3.27)
Don't Know	/	/	/	/	/	/
Total	7.31 (3.29)	7.27 (3.07)	8.46 (3.31)	9.00 (2.94)	9.08 (2.97)	7.68 (3.22)

Notes: values for cells with less than 5 respondents suppressed

Supplementary Table 3 – Further breakdown of respondents' identities and proportion with CESD-D-10 scores suggesting significant depressive symptomology

	Cisgender Female	Cisgender Male	Transgender Female	Transgender Male	Non-binary or identify with another gender (e.g. agender)	Total
Straight-heterosexual	/	/	/	/	/	/
Gay/Lesbian	63.4%	61.3%	/	/	82.4%	64.3%
Bisexual	80.9%	80.0%	/	/	91.7%	80.3%
Queer	100.0%	100.0%	/	/	87.5%	96.0%
Asexual	/	/	/	/	100.0%	100.0%
Identify with another sexuality	66.7%	100.0%	/	/	75.0%	70.6%
Prefer not to say	/	/	/	/	/	83.3%
Don't Know	/	/	/	/	/	/
Total	71.8%	64.2%	76.9%	71.4%	86.8%	71.9%

Notes: values for cells with less than 5 respondents suppressed

Supplementary Table 4 – Continuous model estimates of CES-D-10

	Unadjusted B(SE)	Adjusted B(SE)
Any harassment or inappropriate incidents baseline:		
None		

1			
2			
3	Form of harassment reported	3.875***	2.700**
4		(1.852 - 5.899)	(0.644 - 4.756)
5	No information	0.257	-0.623
6		(-2.992 - 3.507)	(-3.852 - 2.606)
7			
8	Gender ID and Sex Orientation baseline: Cis female		
9	Gay/Lesbian		
10			
11	Cis female of another non-heterosexual orientation	3.249***	2.132*
12		(0.981 - 5.518)	(-0.156 - 4.420)
13	Transgender and gender diverse	4.797***	3.383***
14		(2.636 - 6.958)	(1.164 - 5.602)
15	Cis male gay	1.226	1.027
16		(-0.824 - 3.276)	(-1.020 - 3.074)
17	Cis male of another non-heterosexual orientation	4.336**	2.781
18		(0.435 - 8.238)	(-1.087 - 6.648)
19			
20	Age group baseline: 18-24 years		
21	25-34 years		-1.932
22			(-4.299 - 0.436)
23	35-44 years		-2.899**
24			(-5.359 - -0.439)
25	45-54 years		-4.453***
26			(-7.080 - -1.826)
27	55+ years		-3.974**
28			(-7.385 - -0.564)
29			
30			
31	Change in social status since pandemic baseline:		
32	positive change		
33	Negative change in status		2.649***
34			(0.641 - 4.658)
35	No change		0.746
36			(-1.061 - 2.554)
37			
38	Relationship status baseline: Single		
39	Dating or in a relationship but not living together		0.440
40			(-1.591 - 2.472)
41	Cohabiting/Married/Civil Partner		-1.979**
42			(-3.831 - -0.127)
43	Divorced, Widowed or Prefer not to say		0.416
44			(-4.364 - 5.196)
45			
46	Ethnicity baseline: not an ethnic minority		
47	Ethnic Minority		0.404
48			(-1.780 - 2.587)
49	Prefer not to say		1.076
50			(-5.403 - 7.556)
51	Location: Rest of the world (baseline: UK)		-0.0193
52			(-2.018 - 1.980)
53			
54			
55			
56	Constant	11.22***	14.31***
57		(9.622 - 12.82)	(11.28 - 17.34)
58			
59	Observations	310	310
60			

R-squared	0.126	0.208
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*** p<0.01, ** p<0.05, * p<0.1

Supplementary materials – further notes on measures of harassment and discrimination

Respondents were asked:

Since the start of the coronavirus pandemic, have you experienced any of the following in your day-to-day life (going to the shops, walking around the neighbourhood, etc...) because you are LGBTQ+ or others thought you were LGBTQ+?

- verbal harassment, insults or other hurtful comments;
- physical harassment or violence;
- sexual harassment or violence;
- threat of physical or sexual harassment or violence;
- exclusion from events or activities;
- someone disclosing that you are LGBTQ+ to others without your permission;
- any other inappropriate comments or conduct not listed above (please state).
- None

Respondents were free to select multiple options in terms of forms of discrimination.

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	4	Present key elements of study design early in the paper	7-10
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	10-12,19
Study size	10	Explain how the study size was arrived at	7-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-12
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	10-12
		(b) Describe any methods used to examine subgroups and interactions	
		(c) Explain how missing data were addressed	10-12
		(d) If applicable, describe analytical methods taking account of sampling strategy	
		(e) Describe any sensitivity analyses	8
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	12
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	12, 25-26
		(b) Indicate number of participants with missing data for each variable of interest	12
Outcome data	15*	Report numbers of outcome events or summary measures	12, 25-26

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Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-15, 26-28
		(b) Report category boundaries when continuous variables were categorized	12-15, 26-28
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	15-17
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	17-20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	19
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	21

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.