Longitudinal evidence for persistent anxiety in young adults through COVID-19 restrictions [version 1; peer review: 2 approved with reservations]

Alex S. F. Kwong\textsuperscript{1-3}, Rebecca M. Pearson\textsuperscript{1,2}, Daniel Smith\textsuperscript{1,1}, Kate Northstone\textsuperscript{2}, Deborah A. Lawlor\textsuperscript{1,2}, Nicholas J. Timpson\textsuperscript{1,2}

\textsuperscript{1}MRC Integrative Epidemiology Unit, University of Bristol, Bristol, UK
\textsuperscript{2}Department of Population Health Sciences, University of Bristol, Bristol, UK
\textsuperscript{3}Division of Psychiatry, University of Edinburgh, Edinburgh, UK

Abstract
The coronavirus disease 2019 (COVID-19) pandemic and related mitigation measures are associated with poorer mental health in cross-sectional and longitudinal surveys. However, it's unclear if this represents an adaptive response to an unprecedented event that is short lived, or the beginning of longer mental health problems that persist beyond the initial outbreak of the pandemic. We used data from the index generation of the Avon Longitudinal Study of Parents and Children (young people aged 26-29) to examine anxiety at the beginning of the COVID-19 pandemic (April 2020) and again once restrictions were eased (June 2020). We compared these to two pre-pandemic assessments of anxiety measured 2013/2014 and 2015/17. We found that the percentage of individuals with anxiety was almost double during the COVID-19 assessments compared to pre-pandemic levels, with 15% of individuals having anxiety at both occasions (persistent anxiety). Being female, those with per-existing mental health conditions, a history of financial problems and those who had reported difficulties accessing mental health information were at greater risk of persistent anxiety. Our findings suggest that anxiety in response to COVID-19 is not just an initial reaction but potentially the start of a persistent problem that extends beyond the pandemic. Efforts must be made to address risk groups who could be disproportionately affected as a result of the COVID-19 pandemic and related mitigation measures.

Keywords
COVID-19, pandemic, mental health, ALSPAC, anxiety, longitudinal
This article is included in the Avon Longitudinal Study of Parents and Children (ALSPAC) gateway.

This article is included in the Coronavirus (COVID-19) collection.

Corresponding author: Alex S. F. Kwong (alex.kwong@bristol.ac.uk)

Author roles: Kwong ASF: Conceptualization, Formal Analysis, Investigation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Pearson RM: Conceptualization, Investigation, Writing – Original Draft Preparation, Writing – Review & Editing; Smith D: Investigation, Writing – Review & Editing; Northstone K: Funding Acquisition, Investigation, Writing – Review & Editing; Lawlor DA: Conceptualization, Funding Acquisition, Writing – Review & Editing; Timpson NJ: Conceptualization, Funding Acquisition, Investigation, Writing – Review & Editing

Competing interests: DAL declares receiving research support from several national and international government and charity funders and Roche Diagnostics and Medtronic Ltd for research unrelated to that presented here. Other authors declare no competing interests.

Grant information: The UK Medical Research Council and Wellcome (Grant Ref: 217065) and the University of Bristol provide core support for ALSPAC. A comprehensive list of grants funding is available on the ALSPAC website (http://www.bristol.ac.uk/alspac/external/documents/grant-acknowledgements.pdf). ASFK, RMP, KT, DS, DAL and NJT work in, or are affiliated to, the MRC Integrative Epidemiology Unit which is funded by the University of Bristol and UK Medical Research Council (MC_UU_00011/3 and MC_UU_00011/6). European Research Council under the European Union’s Seventh Framework Programme, and grants 758813, MHINT and 669545 from the European Research Council Grant Agreements. This work was supported by Wellcome through the Wellcome Longitudinal Population Studies COVID-19 Secretariat and Steering Group (UK LPS COVID co-ordination, Grant Ref: 221574). This work was also supported by the NIHR Biomedical Research Centre at University Hospitals Bristol and Weston NHS Foundation Trust and the University of Bristol, which provides support for DAL. The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care. NJT is a Wellcome Trust Investigator (202802), is the PI of the Avon Longitudinal Study of Parents and Children (MRC & WT 217065) and works within the CRUK Integrative Cancer Epidemiology Programme (C18281/A19169). DAL is an NIHR Senior Investigator (NF-0616-10102). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Copyright: © 2020 Kwong ASF et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

How to cite this article: Kwong ASF, Pearson RM, Smith D et al. Longitudinal evidence for persistent anxiety in young adults through COVID-19 restrictions [version 1; peer review: 2 approved with reservations] Wellcome Open Research 2020, 5:195 https://doi.org/10.12688/wellcomeopenres.16206.1

Introduction
Poorer mental health during the early stages of coronavirus disease 2019 (COVID-19) pandemic and related restrictions has been reported in young adults. However, whether this is a transient reaction to an unprecedented situation or the beginning of a rise in mental health disorders that will persist beyond the pandemic is unclear. We measured anxiety in a longitudinal population cohort of young adults in the immediate periods following pandemic restrictions in the UK (April 2020), and when restrictions were eased (June 2020). We compared these with pre-pandemic assessments of anxiety in 2013/2014 and 2015/17.

Methods
We used data from pre-pandemic and COVID-19 surveys nested within the Avon Longitudinal Study of Parents and Children (ALSPAC), an ongoing longitudinal population-based study of 14,901 participants born in the south-west of England between 1st April 1991 and 31st December 1992 (now aged 27–29 years old). This study uses a subset of participants that completed two online COVID-19 questionnaires between April and June 2020. Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and Local Research Ethics Committees. All participants gave consent to take part in the study. This project was approved by the ALSPAC executive committee (B3506).

Anxiety in 2013/2014 and April/June 2020 was measured using the Generalised Anxiety Disorder Assessment (GAD-7), a seven-item instrument measuring generalised anxiety disorder (GAD) symptoms within the last two weeks. Scores range between 0–21 and we used a threshold of ≥10 to determine probable anxiety, which has good sensitivity and specificity for a GAD diagnosis. We supplemented this with anxiety assessed in 2015/17, using the Clinical Interview Schedule – Revised (CIS-R), which uses ICD-10 criteria to derive a diagnosis of GAD using similar questions to GAD-7.

We compared the prevalence of pre-pandemic anxiety in 2013/14 and 2015/17 with COVID-19 anxiety during COVID-19 restrictions in the UK (April 2020) and when restrictions were eased (June 2020). We also estimated absolute prevalence and prevalence ratios for scoring ≥10 on the GAD-7 at both COVID-19 assessments (persistent anxiety) for specific groups who could be at greater risk. Ratios were estimated using multinomial logistic regressions using StataSE, version 15 (StataCorp LLC).

Results
Data were available for 2850 participants in April 2020 and 2571 participants in June 2020. Complete data for both COVID-19 questionnaires were available for 2069 individuals (mean age=27.59 years, SD=0.54).

The percentage of young adults with anxiety in April 2020 (24.4% [95% CI, 22.8%-26%]) and June 2020 (23.8% [95% CI, 22.2%-25.3%]) were similar and almost double compared to pre-pandemic estimates made in 2013/14 (13% [95% CI, 11.9%-14.2%]) and 2015/17 (9.8% [95% CI, 8.9%-10.7%]), see Figure 1.

The absolute prevalence of persistent anxiety by specific groups is shown in Figure 2. Compared to no anxiety at either

![Figure 1. Prevalence of pre-pandemic and COVID-19 (during and after restrictions) anxiety in young adults.](image-url)
COVID-19 questionnaire, being female (PR=3.2 [95% CI, 2.3-4.5]), having pre-pandemic financial problems (PR=2.8 [95% CI, 1.9-4.1]), pre-existing mental health conditions (PR=5.7 [95% CI, 4.3-7.7]) and pre-pandemic difficulties accessing men-
tal health services (PR=3.0 [95% CI, 2.2-3.9]) was associated
with greater prevalence ratios of persistent anxiety. Preva-
lence ratios of persistent anxiety did not vary between health
care workers and non-health care workers.

Discussion
The prevalence of anxiety in young adults after easing
COVID-19 restrictions has remained high; it is still almost dou-
ble compared pre-pandemic levels. This suggests that higher
anxiety due to COVID-19 and associated restrictions is more than
just an immediate reaction that is short lived, but maybe the start
of a much more persistent problem that extends beyond
the pandemic. Experiencing high levels of anxiety for an
extended period is associated with both physiological and
psychological costs that may not be easy to reverse.

Women, those with pre-existing financial problems, those
with mental health conditions and those reporting difficulties
accessing services appear disproportionately affected in terms
of persistent anxiety. It is suggested that provisions could be
made to prioritise these groups for treatment and support in
efforts to avoid heightened morbidity.

Although ALSPAC is a population cohort, there may be selec-
tion bias between those responding to pre-pandemic and
COVID-19 questionnaires. Continued monitoring of anxiety
is needed to fully determine the impact of the COVID-19
pandemic on mental and physical health and future psycho-social
outcomes.

Data availability
Underlying data
ALSPAC data access is through a system of managed open
access. The steps below highlight how to apply for access to
ALSPAC data.

1. Please read the ALSPAC access policy which describes the
process of accessing the data in detail, and outlines the costs
associated with doing so.

2. You may also find it useful to browse the fully searchable
research proposals database, which lists all research projects that
have been approved since April 2011.

3. Please submit your research proposal for consideration by the
ALSPAC Executive Committee. You will receive a response
within 10 working days to advise you whether your proposal
has been approved. If you have any questions about accessing
data, please email alspac-data@bristol.ac.uk

Contributors
ASFK, RMP, DAL and NJT contributed to the conception
and design of the study. ASFK, RMP, DS, KN, DAL, DP and
NJT contributed to the organisation of the conduct of the study.
ASFK carried out the study (including acquisition of data).
ASFK analysed the data. ASFK drafted the initial output. All authors contributed to the interpretation of data. All authors have read and approved the final version of the manuscript. ASFK will serve as guarantor for the contents of the paper.

Acknowledgments
We are extremely grateful to all the families who took part in this study, the midwives for their help in recruiting them, and the whole ALSPAC team, which includes interviewers, computer and laboratory technicians, clerical workers, research scientists, volunteers, managers, receptionists and nurses. The study website contains details of all data available through a fully searchable data dictionary (http://www.bristol.ac.uk/alspac/researchers/our-data/). Part of this data was collected using REDCap, see the REDCap website for details https://projectredcap.org/resources/citations/).

References


Open Peer Review

Current Peer Review Status: ⚙️ ⚙️

Version 1

Reviewer Report 16 October 2020

https://doi.org/10.21956/wellcomeopenres.17797.r40453

© 2020 Stein M et al. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Murray B. Stein
University of California, San Diego, San Diego, CA, USA

Murray Stein
University of California, San Diego, San Diego, CA, USA

This study sought to estimate prevalence of generalized anxiety disorder (GAD) symptoms in a young adult sample in the United Kingdom (UK) during coronavirus disease 2019 (COVID-19) and compare to pre-COVID rates. The study leveraged subsamples from a larger, longitudinal study that previously assessed GAD symptoms in 2013/14 and 2015/17. Using a self-report measure, the subsample was assessed at the outset of COVID-19 (04/2020) and several months later when UK restrictions lightened (06/2020). Multinomial logistic regressions were used to calculate ratio estimates and examine the effect of certain sociodemographic characteristics on anxiety. Rates of GAD symptoms were nearly double in 2020 compared to both prior assessment periods and several characteristics were associated with greater odds of persistent anxiety.

Major strengths of this manuscript include large sample size, longitudinal design, clear and concise writing, and good readability. There are several areas where the article can be improved that are described below.

Approved with Reservations:

My primary concern for this manuscript are the conclusions drawn. Because the authors did not have a baseline pre-COVID (the nearest “baseline” was 3 years prior), conclusions about whether the higher prevalence rates are due to the impact of COVID-19 cannot really be made. Additionally, because COVID-19 has not concluded, it is difficult to say the “persistence of anxiety is more than just an immediate reaction that is short lived.” Given the ongoing nature of COVID-19, it is difficult to confidently conclude what is being assessed is pathological anxiety rather than a normative response to such an event. The manuscript could thus benefit from softening the language around conclusions and explicitly adding these limitations to the discussion section. Repeating the multinominal regression comparing those with anxiety at any one COVID time point versus at both time points could be more helpful in identifying possible factors associated with “persistence.” Finally, since this is a cohort study, a brief rationale for the sociodemographic
characteristics added to the regression is needed and if employment status is available, this should be included as well.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Partly

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Etiology, maintenance, and treatment of PTSD and depression and anxiety-related disorders.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Reviewer Report 14 October 2020

https://doi.org/10.21956/wellcomeopenres.17797.r40452

© 2020 Purves K. This is an open access peer review report distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Kirstin L. Purves
Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, UK

This article uses data from the ALSPAC cohort to establish prevalence rates of moderate to severe anxiety, measured using the GAD-7 questionnaire, at two points of the 2020 COVID-19 pandemic (the implementation and relaxation of UK-wide lockdown respectively). These are compared to earlier prevalence rates of moderate to severe anxiety symptoms (2013/2014) and likely diagnosis
of generalised anxiety disorder (2015/2017) in the same cohort of individuals to assess whether there has been an increase during the pandemic. The authors go on to assess whether members of specific groups have a higher prevalence of persistent high to moderate anxiety during the pandemic (scoring > 10 on the GAD at both pandemic time points).

The paper is clear, well written and focused. Methods and results are well described. Figures are used well to communicate pertinent information. The topic is clearly important and the findings are a useful addition to our understanding of changes in anxiety across time, and potentially the impact of the COVID-19 pandemic and associated social regulations.

That said, I would seek clarification and expansion on some points. The conclusions as they currently stand are not well supported by the findings, and I would like to see more nuanced discussion of potential limitations. I suggest some sensitivity analyses that I feel might be able to strengthen the authors’ conclusions.

**Major comments:**

My main concern with this article is the conclusions drawn based on the analyses presented. Unfortunately, the significant time (and age) gap between pre-pandemic and pandemic assessments hinders the ability to draw strong conclusions about the specific impact of the pandemic and associated social regulation. Whilst this is one potential explanation, I would like to see more consideration of other factors that might explain your findings.

I have two major points in this regard:

1. First, there is evidence that the lifetime prevalence of anxiety, if you collapse across all anxiety disorders, is higher in 25-28 year olds than 16-24 year olds (McEvoy et al., 2011; Somers et al., 2006). At least one study finds the prevalence of generalised anxiety disorder specifically in this older group is over double that of 15-24 year olds (Wittchen and Hoyer, 2001).

   I've provided links to these three studies below. Given the pre-pandemic assessments of anxiety in this cohort took place in the participants’ early twenties (22-24 years), and the pandemic assessments have taken place in their late twenties (~28 years), the increase in prevalence you are observing is confounded by increased prevalence observed across early adulthood. I think at the very least this needs to be highlighted in your discussion, and will impact the conclusions you are able to draw.

2. Second, the factors you find associated with persistent anxiety (being female, having a history of financial problems, pre-existing mental health conditions, difficulty accessing MH services) are all risk factors for higher anxiety more generally. I am not convinced that this represents groups of people who are at most risk from persistent increased anxiety during the pandemic specifically, rather than at increased risk for anxiety in general. I think it is important to emphasise the increased need in these groups regardless of the cause, but you need to be clearer about the limitations of your data for drawing conclusions about pandemic specific risk.

   You may be able to speak to this a little more by performing sensitivity analyses checking
whether these same groups a) have a higher prevalence of anxiety in your pre-pandemic data waves, b) are more likely to experience persistent anxiety across all 4 time points.

**Specific comments by section:**

**Introduction:**
- In the first sentence you cite papers from both the UK and the US. Given the global nature of the pandemic and the uncertainty of any differential impact based on different social regulations, I think it would be helpful to state this in the text.
- Please specify the age range you are referring to when you use the term “young adult”.
- The introduction could do with providing a bit more context. Is there any reason to think this anxiety might persist beyond the situational trigger? Is there any context for why you selected the subgroups you did for your second analysis?
- Importantly, I would find it helpful if you include context about why you selected the time periods you did as indicators of persistent anxiety beyond the pandemic.

**Methods:**
- Citation needed for the statement that GAD >=10 has good sensitivity for GAD diagnosis
- The CIS-R proves difficult to find. Please provide more explanation about how the CIS-R compares to the GAD7. Given the fact that CIS-R is intended to derive diagnoses, I imagine it covers a different time frame from the GAD-7, which asks about symptoms over the preceding two weeks. Please specify.

**Results:**
- Sensitivity checks performed seem sensible given the time scale covered by the GAD-7 (two weeks). I would like to know the dates you chose as cut offs for late and early June. I assume the late June cut off was at least two weeks after the most substantial easing of restrictions on the 1st of June, but if not, this would be a helpful sensitivity group to include. Please briefly include these dates, and the prevalence estimates for each group.

**Discussion:**
- I think it is important to be a little more circumspect about these findings. This is a really interesting study, in a valuable longitudinal cohort. It speaks to our understanding of anxiety, and may have implications for the long term fallout of the pandemic. However, I think there are too many potential confounding factors to draw strong conclusions about the impact of the pandemic on anxiety and its persistence on the basis of this study alone.
- Highlighting groups at disproportionate risk for persistent anxiety is an important takeaway regardless of whether these risks are due to, or predate the pandemic. I think it would be worth making this point explicitly.
- I wholeheartedly agree that continued monitoring is needed. I would add as an explicit caveat in your discussion that your data has captured a relatively small window and so does not yet speak to persistence of anxiety beyond the pandemic.
I hope to see more data from ALSPAC as the pandemic progresses to contribute to our understanding and response as the situation continues.

References

Is the work clearly and accurately presented and does it cite the current literature? Partly

Is the study design appropriate and is the work technically sound? Yes

Are sufficient details of methods and analysis provided to allow replication by others? Yes

If applicable, is the statistical analysis and its interpretation appropriate? Partly

Are all the source data underlying the results available to ensure full reproducibility? Yes

Are the conclusions drawn adequately supported by the results? No

**Competing Interests:** I am a co-investigator on the Repeated Assessment of Mental Health in Pandemics (RAMP) study, which is also investigating the impact of the pandemic on mental health.

**Reviewer Expertise:** Psychology, anxiety, statistical genetics

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.