PEER REVIEW HISTORY

BMJ Paediatrics Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Associations between parental mental health and other family factors and healthcare utilisation among children and young people: a retrospective, cross-sectional study of linked healthcare data
AUTHORS	Dreyer, Kathryn; Williamson, Robert; Hargreaves, Dougal; Rosen, Rebecca; Deeny, Sarah

VERSION 1 – REVIEW

REVIEWER	Reviewer name: Sarah Nevitt Institution and Country: University of Liverpool, United Kingdom Competing interests: I have no competing interests
REVIEW RETURNED	26-Feb-2018

GENERAL COMMENTS	I have provided a statistical review of the manuscript: "Associations between parental mental health and other family factors and healthcare utilisation among children and young people: a retrospective, cross-sectional study of linked healthcare data." This is a very interesting piece of work, performed to a high methodological standard with important conclusions (at least from my non-clinical expert perspective). I have only a few minor comments for the authors, mainly around wording, to ensure complete clarity of an already well written manuscript 1) The title, abstract objective and 'What is already known on this topic?' specifically highlight parental mental health (as well as other long term conditions) as being the focus of this work. However, the introduction does not seem to discuss mental health specifically at all. Please add a sentence or two on what is already known on mental health and links to child health care usage and/or the rationale for specifically considering the association with mental health. 2) Page 5 – please define QOF codes 3) Page 5 – CYP are defined as under the age of 16 and adults are age 18 or over. I assume this means that the data of 16 and 17 year olds was not used in this work? 4) Page 6, line 44. 'Household characteristics… the total number of patients in the household.' How exactly would a 'patient' be defined here? Is this all people living within the household or just people using the healthcare services? (i.e. those with no GP, emergency department visits etc. would not be included here?) 5) Sensitivity analysis – "… to determine whether there were any significant changes in the results.

	' Please clarify if you mean differences in statistical significance or 'notable' differences (and if the latter please use a different word to avoid confusion with statistical significance). 6) Page 8 / Appendix 4 – Characteristics for children with siblings – perhaps add a sentence into the results text regarding whether characteristics for children with siblings are comparable to all children (or any notable differences)? 7) Results – thank you for the statistical appendix but please clarify why +1 is added to the mean for parental health care utilisation. (Presumably because the actual mean value is less than 1). 8) Page 8 – please note in the text that the odds ratios for inpatient admission and outpatient appointments can be found in Appendix 5. It is not immediately clear from first reading. 9) Page 12 – in reference to sample size being too small, I assume this means the size of the age subgroups within the subgroup with patients with osteoarthritis rather than the overall sample size which in my opinion isn't too bad! 10) Page 13 (related to the last comment) – it's all subjective but I wouldn't consider this sample size to be a small one and some fairly precise results are produced so I don't consider the sample size to be a limitation. What is a limitation is that the sample comes from only a single GP practice within a single London Borough, therefore whether results are generalizable to other areas of London or other areas of the UK is questionable. The authors do acknowledge this and also that any practice specific factors may have influenced results but perhaps a little more discussion on the generalizability to other areas would be helpful? 11) What this study adds – please be careful with the wording here as one of these figures is a rate rather than odds and other factors are adjusted for in the model. This is better worded in the abstract (and I do appreciate that it is meant to be single sentences within 'What this study adds) – try to reword if possible.

REVIEWER	Reviewer name: Prof Mitch Blair Institution and Country: Imperial College London Competing interests: Currently supervising MD funded by Health Foundation who is undertaking an RCT of parental information provision to reduce ED reattendance
REVIEW RETURNED	19-Mar-2018

GENERAL COMMENTS	This paper is original and makes the connection between parental health care utilisation and parental mental health status with the child's health utilisation patterns. A strength of the study is its GP base and linked records. However, I would have thought that parental anxiety would have been a major factor in determining additional child utilisation and this doesn't appear to have been explored. Can the authors expand on this aspect? Similarly there would be good records on whether the parents have received medication or non medication therapies and whether severity of depression might be important here would also be worth commenting on.For example those with severe mental health issues such as psychosis may be low users of services .

	Similarly those with borderline personality disorders are very high users. These could have been alternative sensitivity analyses- can the authors address this? Some further detailed comments are shown below Page 6 3rd paragraph-long term Define long term. and how precisely these were derived Page 7 4rth paragraph: 614 who don't live with an adult.. Could it be LAC children/under SS ? Pge 12 - first paragraph. What justification do the authors have for selecting parents of 50 children only as their sampling frame? There may be more than 7 chronic conditions in the parents but it is not clear why these were specifically selected. Please can you clarify further in the text how the sensitivity analyses specifically added to the evidence and robustness of the findings. Page 12 in the discussion is there any evidence that relates increased perception of vulnerability with depression given the aforementioned re other forms of mental illness. Page 13 second para "provides a uniquely complete insight into family and community structures" - more data would be expected on ethnicity, age of parents , education etc.. Para 3 -other long term conditions not recorded - what would these likely to be if not known by GP? It may be useful to have widened the analysis beyond 55 years in order to include possible grandparent support. This might be commented upon.

VERSION 1 – AUTHOR RESPONSE

Reviewer #1 – Sarah Nevitt

1) The title, abstract objective and 'What is already known on this topic?' specifically highlight parental mental health (as well as other long term conditions) as being the focus of this work. However, the introduction does not seem to discuss mental health specifically at all. Please add a sentence or two on what is already known on mental health and links to child health care usage and/or the rationale for specifically considering the association with mental health.

Our response:

Thank you for your comment. We have now added a sentence to the introduction which outlines what is known about the relationship between parental mental health and health outcomes, including healthcare utilisation, for children. Please find changes made to the manuscript in paragraph 3 of the introduction.

There is some evidence that family context may have an important role influencing the healthcare utilisation and needs of their children; through the availability of knowledge, skills, social support,[11–13] and health-seeking behaviour and preferences.[14] Poor parental mental health is associated with negative health outcomes for children,[15] and parental anxiety is a contributing factor to a child's utilisation of healthcare services. [16] Furthermore, shared genetic risks and the wider social determinants in the household [17]…

2) Page 5 – please define QOF codes

Our response:
For clarity, we have changed QOF to Quality and Outcomes Framework (QOF) in the manuscript. We have also included a list of long-term conditions that are included in the framework.

3) Page 5 – CYP are defined as under the age of 16 and adults are age 18 or over. I assume this means that the data of 16 and 17 year olds was not used in this work?

Our response:
This assumption is correct. As CYP are defined as under the age of 16 and adults as over the age of 18, we excluded all patients aged 16 and 17 from the analysis. To make this clear in the manuscript, we have added a sentence under the 'Study setting, dataset, inclusion and exclusion criteria' section in Methods stating that patients aged 16 and 17 were excluded. We have also included this as a limitation in the Discussion section where we highlight that all patients living at the same address were considered as a family.

4) Page 6, line 44. 'Household characteristics… the total number of patients in the household.' How exactly would a 'patient' be defined here? Is this all people living within the household or just people using the healthcare services? (i.e. those with no GP, emergency department visits etc. would not be included here?)

Our response:
A patient is defined as all people living in the household that are registered at the GP practice. To clarify this we have added the following sentence to the final paragraph of 'Study setting, dataset, inclusion and exclusion criteria':
…any person living at the same address that was not registered at the general practice was not included in this analysis
We have also included this as a limitation in the discussion section.
We classified all patients living at a single address as families and as being either a parent or a child; however, there may be multiple families at a single address or unrelated people which are included in the analysis.

5) Sensitivity analysis – "… to determine whether there were any significant changes in the results.' Please clarify if you mean differences in statistical significance or 'notable' differences (and if the latter please use a different word to avoid confusion with statistical significance).

Our response:
Thank you for the suggestion. There were no notable differences, rather than differences in statistical significance. The wording of the sentence has been updated as follows:
Finally, we increased the thresholds for our secondary care outcomes to at least two instances of use, to determine whether the model is robust at higher levels of utilisation and to determine whether there were any notable changes (including statistically significant changes) in the results

6) Page 8 / Appendix 4 – Characteristics for children with siblings – perhaps add a sentence into the results text regarding whether characteristics for children with siblings are comparable to all children (or any notable differences)?

Our response:
Thank you for the suggestion. We have added a sentence noting that characteristics for children with siblings are not notably different to the characteristics of children without siblings. The following sentence was adjusted and now reads as follows:

Characteristics for children with siblings are not notably different to characteristics of children without siblings and results from modelling CYP with siblings and CYP without siblings were consistent.

7) Results – thank you for the statistical appendix but please clarify why +1 is added to the mean for parental health care utilisation. (Presumably because the actual mean value is less than 1).

Our response:
Thank you for your comment. Rates and odds ratios were produced to interpret the results. This was discussed in the appendix, however for clarity we have included a sentence in the statistical methods section to highlight this.

All results reported are odds and rate ratios. As parental healthcare utilisation is a continuous variable in the model, the results can be interpreted as a one point increase in parental healthcare utilisation is associated with an X% increased odds of child healthcare utilisation. The +1 was intended to explain this. To avoid confusion, we have removed all +1 from the mean from the tables of results. We have also included a sentence in the text of the results that explains this. The results now read as follows:
Controlling for other CYP and parental characteristics (model 2), parental healthcare utilisation was associated with increased CYP healthcare utilisation across all four healthcare services - general practice rate ratio 1·07 (95% CI 1·06 to 1·08); emergency department attendance odds ratio 1·27 (95% CI 1·12-1·44); inpatient admission odds ratio 1·43 (95% CI 1·06-1·93); and outpatient attendance odds ratio 1·08 (95% CI 1·01-1·15). For example, a one point increase in parental emergency department utilisation is associated with a 27% increased odds of child emergency department attendance. Parental depression (vs not) …

8) Page 8 – please note in the text that the odds ratios for inpatient admission and outpatient appointments can be found in Appendix 5. It is not immediately clear from first reading.

Our response:
Thank you for your comment. We have included the following sentence:
The best fitting models for each outcome of interest, including inpatient admissions and outpatient appointments, are given in appendix 5.

9) Page 12 – in reference to sample size being too small, I assume this means the size of the age subgroups within the subgroup with patients with osteoarthritis rather than the overall sample size which in my opinion isn't too bad!

Our response:
Thank you for your comment. This sentence was in reference to the sample sizes of subgroups by age, which are too small to perform analyses. To avoid confusion regarding sample size, we have adjusted the sentence as follows:
The association between osteoarthritis and general practice appointments was consistent with the main results; however, the subgroup analysis did not inform any specific trends as the sample size of the subgroup by age was too small

10) Page 13 (related to the last comment) – it's all subjective but I wouldn't consider this sample size to be a small one and some fairly precise results are produced so I don't consider the sample size to be a limitation.

What is a limitation is that the sample comes from only a single GP practice within a single London Borough, therefore whether results are generalizable to other areas of London or other areas of the UK is questionable.

The authors do acknowledge this and also that any practice specific factors may have influenced results but perhaps a little more discussion on the generalizability to other areas would be helpful?

Our response:
Thank you for the suggestion. We agree that the most notable limitation is that patients are all located at a single GP practice in London. We have reworded this section of the discussion to highlight this as the primary limitation, rather than sample size.

The start of the paragraph now reads as follows:
A number of limitations of this study should be noted. Patients are all registered at, and live in the proximity of, one general practice in South East London; and there may be area-level effects or specific policies at this general practice that influence patient behaviour. As a result, this cohort may not be representative of the general population. This impacts the generalisability of these results to other areas across the country. The sample size limited our ability to perform subgroup and sensitivity analyses and to detect significance of parental conditions in models of families with no siblings

11) What this study adds – please be careful with the wording here as one of these figures is a rate rather than odds and other factors are adjusted for in the model. This is better worded in the abstract (and I do appreciate that it is meant to be single sentences within 'What this study adds) – try to reword if possible.

Our response:
Thank you for the suggestion and noting the rate ratio vs odds ratio. We have adjusted the wording in these sentences to be more consistent with our introduction and to avoid confusing odds and rate ratios.

The sentences now read as follows:
What this study adds?
After adjusting for child and parental characteristics, parental depression is associated with 41% increased odds of ED attendance, 47% increased odds of inpatient admission, and 67% increased odds of outpatient appointments in CYP.

The association between parental depression and healthcare use is significantly stronger among CYP aged 11-15 years compared to other age groups.
Parental utilisation of general practice appointments and emergency department attendance increase the risk of child utilisation of these services.

Reviewer #2 – Prof Mitch Blair
This paper is original and makes the connection between parental health care utilisation and parental mental health status with the child's health utilisation patterns. A strength of the study is its GP base and linked records. However, I would have thought that parental anxiety would have been a major factor in determining additional child utilisation and this doesn't appear to have been explored. Can the authors expand on this aspect? Similarly there would be good records on whether the parents have received medication or non medication therapies and whether severity of depression might be important here would also be worth commenting on. For example those with severe mental health issues such as psychosis may be low users of services . Similarly those with borderline personality disorders are very high users. These could have been alternative sensitivity analyses- can the authors address this? Some further detailed comments are shown below.

Our response:
Thank you for your comments. Indeed, the relationship between parental anxiety and healthcare utilisation in children is an element we are trying to explore in this paper.

Anxiety is coded with depression, so the depression covariate in this study includes depression and/or anxiety. We have adjusted the wording in the paper to highlight that the depression covariate includes anxiety. Unfortunately, anxiety is not coded separately so could not be included as a separate covariate.

We agree that the severity of mental health issues would potentially influence a child's utilisation of healthcare services and that these would have made interesting alternative sensitivity analyses. We had access to indicator variables for depression and for severe mental health conditions (schizophrenia, bipolar affective disorder and other psychoses). However, there were an insufficient number of children who had parents with a mental health indicator for it to be informative as a covariate in our model. Furthermore, we did not have any other information available to break down our sensitivity analyses into separate mental health conditions. A similar problem exists for parents on psychosis medication. Unfortunately, in the cohort used for this study, sample sizes are too small for more granular analyses to be carried out.

Despite not being able to include these additional analyses, we believe that the analysis presented in this paper is sufficient to address our research question which aims to investigate the impact of a mental health condition, parental health-seeking behaviours and household factors which are associated with healthcare utilisation among CYP. We believe that in spite of these limitations, our study makes a valuable contribution to the literature by demonstrating that the healthcare utilisation of CYP is associated with health-seeking behaviour of adults in the household. our study is still interesting and makes a valuable contribution to the literature.

Page 6
3rd paragraph-long term
Define long term. and how precisely these were derived

Our response:
We have reworded this sentence to clarify that long-term conditions were identified using QOF read codes. We have also expanded the description of long-term conditions on the previous page and have included a list of examples of conditions that were included in the analysis.

The sentence on page 5 now reads as follows:
Long -term conditions were identified from the GP record using Quality and Outcomes Framework (QOF) read codes; these included arterial fibrillation, asthma, cancer, chronic heart disease, chronic kidney disease, chronic obstructive pulmonary disease, dementia, depression, diabetes, epilepsy, heart failure, hypertension, a learning disability, a mental health condition (schizophrenia, bipolar affective disorder and other psychoses), osteoarthritis, osteoporosis, peripheral artery disease, palliative care, rheumatoid arthritis and stroke or transient ischemic attack.
The sentence on page 6 now reads as follows:
The observed CYP characteristics were age, sex, socio-economic deprivation and diagnosis of any long-term conditions using QOF read codes.

Page 7
4rth paragraph: 614 who don't live with an adult..
Could it be LAC children/under SS ?

Our response:
Based on conversations with practice staff and given the geographical location of the practice, it was assumed that all children who were identified as not living with an adult were actually living with adults registered at a different GP practice. As we did not have details of these adults demographics and healthcare utilisation, these children were excluded from the analysis.

Pge 12 - first paragraph. What justification do the authors have for selecting parents of 50 children only as their sampling frame? There may be more than 7 chronic conditions in the parents but it is not clear why these were specifically selected.

Please can you clarify further in the text how the sensitivity analyses specifically added to the evidence and robustness of the findings.

Our response:
We only included long-term conditions which were present in the parents of at least 50 children. In other words, conditions which we identified in the parental population were only included in the analysis if there were at least 50 children who had a parent with that long-term condition. This avoids data sparsity issues.

To avoid confusion with sampling issues we have adjusted the sentence to read as follows:
Only long-term conditions that were present in the parents of at least 50 CYP were reported on and used in our model, to avoid data sparsity issues.
Please see our response to the first comment regarding sensitivity analyses.

Page 12 in the discussion is there any evidence that relates increased perception of vulnerability with depression given the aforementioned re other forms of mental illness.

Our response:
Thank you for highlighting this point. There is evidence that parental anxiety is a contributing factor in health seeking behaviour in young children. We have included a sentence to this effect in the discussion section.

Page 13 second para "provides a uniquely complete insight into family and community structures" - more data would be expected on ethnicity, age of parents , education etc..

Our response:
Thank you for your comment. We agree that more data would be expected for a complete insight into family and community structures. We have adjusted the sentence as follows:

As the practice provides care to all residents in the local area and is free at the point of use, it provides a unique insight into family and community structures within its catchment area.
Para 3 -other long term conditions not recorded - what would these likely to be if not known by GP?

Our response:
Thank you for your comment. We agree that there are unlikely to be long term conditions that a patient is undergoing treatment for that are not known by the GP. We have removed this sentence from the discussion section.

It may be useful to have widened the analysis beyond 55 years in order to include possible grandparent support. This might be commented upon.

Our response:
The focus of the paper was on the impact of parental long-term conditions on the health utilisation of CYP and support from grandparents was not specifically examined in this paper. One of the limitations of this paper that we discuss in the final section is that there is no information regarding social support through grandparents or other family living in the area.

However, one of the variables considered for inclusion in the models was the total number of people in the household. This would take account of additional people in the household including siblings and grandparents. This variable was not included in the final models as it was not statistically significant.

VERSION 2 – REVIEW

REVIEWER	Reviewer name: Sarah Nevitt Institution and Country: University of Liverpool, United Kingdom Competing interests: I have no competing interests
REVIEW RETURNED	30-Apr-2018

GENERAL COMMENTS	Thank you to the authors for their efforts in addressing my statistical comments. I am happy to recommend this manuscript for publication