

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Association between household context and emergency hospital use in older people: a retrospective cohort study on indicators for people living alone or living with somebody with frailty, developed from routine healthcare data in England
<b>AUTHORS</b>	Lloyd, Therese; Crellin, Elizabeth; Brine, Richard; Shen, Julia Y.; Wolters, Arne

### VERSION 1 – REVIEW

<b>REVIEWER</b>	Declan Byrne Trinity College, Dept. of Medical Gerontology, School of Medicine
<b>REVIEW RETURNED</b>	11-Jan-2022

<b>GENERAL COMMENTS</b>	<p>This is a closely argued paper demonstrating the benefits of leveraging the power of routinely collected aggregate, anonymised data. The strengths and limitations are clearly outlined and the regression models are considered and thoughtfully executed.</p> <p>This study sets out how big data can inform health planning, commissioning and assist in population health management.</p>
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<b>REVIEWER</b>	Kimberley Smith University of Surrey, FHMS
<b>REVIEW RETURNED</b>	15-Feb-2022

<b>GENERAL COMMENTS</b>	<p>Overall, a well-written paper examining the link between a.) living alone vs. living in a multi-person household and b.) living with someone who is frail vs. living with someone who is not identified as frail with two indicators of healthcare utilization.</p> <p>The paper would make a useful contribution to the literature, and any comments I have are minor or things that might help to clarify things for their reader.</p> <p>1.) Referencing isn't done correctly - the number should come before, rather than after the full-stop.</p> <p>2.) In the title and throughout it could be good to clarify that the study is focused on older adults household composition, as it wasn't clear the study was focused on older adults till the methods.</p> <p>3.) The 'social context factors' are focused around household composition and the use of the term 'social context factors' which is very wide and not necessarily representative of what you capture in this analysis – would it be worth reframing the paper using the term 'household composition' rather than 'social context factors'?</p>
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	<p>4.) Could the authors clarify to readers that a full list of covariates in included in the supplementary materials in the statistical methods section (i.e., for a full list of covariates see supplementary index 2).</p> <p>5.) In reporting results in the discussion it would be good to clarify that you results represent healthcare utilization over 1 year.</p> <p>6.) One issue in the introduction and discussion that was potentially problematic (even though you were quite conservative in phrasing) was in terms of implications for research on 'living alone' for social isolation. I think it would be a lot clearer to just focus on your household composition measures without inferring what this could mean for issues such as social isolation - which is beyond the scope of the analysis you have performed (there are a lot of studies that have examined household composition and healthcare use, so there should be enough there for you to speak about without making reference to social isolation).</p>
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<b>REVIEWER</b>	Thomas Cudjoe Johns Hopkins Medicine, Medicine: Division of Geriatric Medicine and Gerontology
<b>REVIEW RETURNED</b>	20-Feb-2022

<b>GENERAL COMMENTS</b>	<p>Thank you for the opportunity to review “Developing social context factors associated with emergency hospital use from national administrative health data: a retrospective cohort study”. This manuscript applies novel methods and leverages retrospective cohort data using national administrative hospital and address data from a central database of all patient registrations in England.</p> <p>Overall:</p> <ol style="list-style-type: none"> <li>1. Manuscript could be improved in various areas through revising long sentences, this could increase coherence. For instance, pg 4 of 25 Line 24-28</li> <li>2. Headings for Sensitivity analysis and subgroup analysis could be further detailed to state what groups are being examined.</li> </ol> <p>Background:</p> <ol style="list-style-type: none"> <li>1. The word “social” is used many times...social determinants, social care system, social networks, social circumstance, social needs, social context, social care datasets. Defining each of these relevant terms in a definition box could improve coherence for readers not familiar with each term.</li> <li>2. In the background and elsewhere in the text the authors suggest that living alone and living with frail individuals are social context indicators. These living arrangements or household composition factors are part of a broader construct. The authors should explicitly state and reference other domains.</li> </ol> <p>Methods</p> <ol style="list-style-type: none"> <li>1. The authors should consider revising lines 18 pg 6 of 26- social context factors section and other places thereafter. Living alone and living with a frail individual (social context factors) are risk factors for social isolation rather than proxies for it.</li> <li>2. Line 42 pg 6 of 26 statistical analysis section. Please clarify what adjusting for English region is, also please clarify “those predictive of emergency use” is this referring to long term conditions that follow (i.e frailty indicators) or something else. If this “those predictive of emergency use” is something else please include these conditions in supplemental file otherwise revise text to clarify this.</li> <li>3. Pg 7 of 26 Line 23-24- Authors chose to omit prior hospital use a covariate. Prior hospital use can be an important predictor of future</li> </ol>
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	<p>hospital use. Please report results of analyses as a supplemental file.</p> <p>4. Please specify numerical cut points for socio-economic deprivation- quintiles.</p> <p>Discussion</p> <p>1. Pg 12 of 26 As above comment about living arrangement/household composition in this manuscript are risk factors for social isolation rather than proxies. Also pg 13 of 26 line 5 and 6.</p> <p>Conclusion</p> <p>1. Line 52 Pg 14 of 26 Please offer more thoughts and ideas about the “additional support” that is needed for study group or those like them.</p>
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**VERSION 1 – AUTHOR RESPONSE**

	<b>Reviewer 1</b>	
6	<p>This is a closely argued paper demonstrating the benefits of leveraging the power of routinely collected aggregate, anonymised data. The strengths and limitations are clearly outlined and the regression models are considered and thoughtfully executed.</p> <p>This study sets out how big data can inform health planning, commissioning and assist in population health management.</p>	Thank you for your positive feedback
	<b>Reviewer 2</b>	
7	<p>Overall, a well-written paper examining the link between a.) living alone vs. living in a multi-person household and b.) living with someone who is frail vs. living with someone who is not identified as frail with two indicators of healthcare utilization.</p> <p>The paper would make a useful contribution to the literature, and any comments I have are minor or things that might help to clarify things for their reader.</p>	Thank you for your positive comments
8	<p>Referencing isn't done correctly - the number should come before, rather than after the full-stop. [NOTE FROM THE EDITORS: This is not accurate - please feel free to rebut this reviewer comment]</p>	The editor has confirmed that the referencing has been done correctly, with the number coming after the full stop, so no further action needed.
9	<p>In the title and throughout it could be good to clarify that the study is focused on older adults household composition, as it wasn't clear the study was focused on older adults till the methods.</p>	We have added this to the title (page 1, line 7) and also to the objectives in the abstract (page 2, line 5).
10	The 'social context factors' are	Thank you, this is a very valid point. We have

	focused around household composition and the use of the term 'social context factors' which is very wide and not necessarily representative of what you capture in this analysis – would it be worth reframing the paper using the term 'household composition' rather than 'social context factors'?	changed to wording to 'household context factors' throughout the paper, which we think better reflects the indicators than 'household composition'.
11	Could the authors clarify to readers that a full list of covariates is included in the supplementary materials in the statistical methods section (i.e., for a full list of covariates see supplementary index 2).	Thank you, we have clarified that Supplementary File 2 contains a full list of covariates (page 6, line 11).
12	In reporting results in the discussion it would be good to clarify that you results represent healthcare utilization over 1 year.	We have clarified this at the start of the discussion section (page 11, line 38).
13	One issue in the introduction and discussion that was potentially problematic (even though you were quite conservative in phrasing) was in terms of implications for research on 'living alone' for social isolation. I think it would be a lot clearer to just focus on your household composition measures without inferring what this could mean for issues such as social isolation - which is beyond the scope of the analysis you have performed (there are a lot of studies that have examined household composition and healthcare use, so there should be enough there for you to speak about without making reference to social isolation).	<p>Thank you for your helpful thoughts on this very valid point. Another reviewer has provided similar feedback, as well as commented that living alone is risk factor, rather than a proxy, for social isolation (see comments #19 and #23).</p> <p>We agree that the implications for research on 'living alone' for social isolation are not straightforward and we think we have made appropriate changes as a result of your feedback. For reference, living alone has been considered as a proxy (or 'marker') for social isolation in the literature – see eg Holt-Lunstad 2015 'Loneliness and social isolation as risk factors for mortality: a meta-analytic review'. Furthermore, Bucholz et al 2011 'Effect of living alone on patient outcomes after hospitalisation for acute myocardial infarction' found that individuals living alone had lower social support scores than others, - also supporting the hypothesis that people living alone are more often socially isolated.</p> <p>Although we do not, of course, want to infer conclusions that are not supported by the data, these two factors were created based on the hypothesis that they may go some way in picking up on some important social context, and we think the results support, rather than weaken this hypothesis. Many individuals who live alone, do so out of choice and have a social network that they are happy with. Living alone is not detrimental to somebody's health per se; it is underlying but unobserved factors that affect people's health that we are trying to get at.</p> <p>We have changed the way we talk about our metrics and have added that living alone is a risk factor for social isolation, without entirely omitting that living alone could be a proxy/marker for social isolation, for the reasons mentioned above:</p> <ul style="list-style-type: none"> <li>• We have changed the wording slightly in the background section: 'Living alone is a risk factor for social isolation and may therefore be a marker of social isolation'</li> </ul>

		<p>and have referenced the papers listed above (page 3, lines 35-36)</p> <ul style="list-style-type: none"> <li>• We have moved the following text previously under Methods/Household context factors: 'Living alone may also have a detrimental effect on a person's nutrition, mobility and medication compliance' (page 5, lines 32-34) to the background section to make clearer that the living alone indicator might also be picking up on other unobserved confounders (page 4, lines 2-3)</li> <li>• In the discussion section, we have also amended the language around proxies: 'It is important to note that although older people living alone may be at higher risk of social isolation, this is an imperfect proxy at best' (page 12, lines 6-7)</li> <li>• We have made clear in the discussion section that this analysis does not provide insight into the mechanism by which these two factors affect individuals' emergency hospital use (page 12, lines 14-15).</li> </ul> <p>In strengths and limitations, we have also amended the wording to 'While prior studies <i>on living alone or informal carers</i> have...' instead of referring to social isolation (page 12, line 43)</p>
	<b>Reviewer 3</b>	
14	Thank you for the opportunity to review "Developing social context factors associated with emergency hospital use from national administrative health data: a retrospective cohort study". This manuscript applies novel methods and leverages retrospective cohort data using national administrative hospital and address data from a central database of all patient registrations in England.	
Overall		
15	Manuscript could be improved in various areas through revising long sentences, this could increase coherence. For instance, pg 4 of 25 Line 24-28	Thank you for highlighting this... We have shortened sentences throughout the document.
16	Headings for Sensitivity analysis and subgroup analysis could be further detailed to state what groups are being examined.	Thank you for the suggestion; this has been done (page 11, lines 5, 10, 23 and 30).
Background		
17	The word "social" is used many times...social determinants, social care system, social networks, social circumstance, social needs, social context, social care datasets. Defining each of these relevant terms in a definition box could improve coherence for readers not familiar with each term.	<p>We acknowledge that the word 'social' features heavily (even after changing 'social context factors' to 'household context factors'). We think that a definition box is not necessary and would take away from the main message of the paper, but we have tried to add further details to the background section, to make these concepts clearer:</p> <ul style="list-style-type: none"> <li>• 'The 'social determinants of health'[1] – <i>social context</i> factors outside of the health</li> </ul>

		<p>and social care system that affect a person's health, such as...' (page 3, lines 4-5)</p> <ul style="list-style-type: none"> <li>• 'social networks (eg family and friends)' (page 3, line 5)</li> <li>• 'a person's social context informs care: (...) patients' needs were often primarily related to socio-economic factors such as isolation, poor housing or living arrangements, and other issues' (page 3, lines 8-11).</li> </ul> <p>We also moved the sentence 'Social isolation reflects a lack of personal ties, social integration or sense of community' from page 5, lines 27-28 to page 3, lines 37-38).</p>
18	In the background and elsewhere in the text the authors suggest that living alone and living with frail individuals are social context indicators. These living arrangements or household composition factors are part of a broader construct. The authors should explicitly state and reference other domains.	Thank you, this links to comments made by another reviewer (see comment #10). We agree that our household context factors are but a very small part of a broader construct around 'social context', and so we have changed our wording to 'household context factors' throughout the document. We mention other domains in the background section (page 3, lines 8-11).
Methods		
19	The authors should consider revising lines 18 pg 6 of 26- social context factors section and other places thereafter. Living alone and living with a frail individual (social context factors) are risk factors for social isolation rather than proxies for it.	We have moved most of the text in the second paragraph of the 'Household context factors' section (page 5, lines 27-34) to the background section, and at the same time clarified that living alone is a risk factor for social isolation (page 3, lines 35-36). As mentioned in response to comment #3, we have also added that as a risk factor, it may be a marker of social isolation and have added a reference to that effect.
20	Line 42 pg 6 of 26 statistical analysis section. Please clarify what adjusting for English region is, also please clarify "those predictive of emergency use" is this referring to long term conditions that follow (i.e frailty indicators) or something else. If this "those predictive of emergency use" is something else please include these conditions in supplemental file otherwise revise text to clarify this.	England can be subdivided into 9 areas (regions) which historically had some devolved functions and are considered to differ slightly. We have changed the text to be clearer: 'geographical region (nine areas of England)' (page 6, line 2). We have also specified that we are referring to 'geographical regions' on page 4, line 37 and in the footnote to the table on page 10, line 24. We have made the sentences on covariates clearer and we have clarified that the full list of covariates are listed in Supplementary File 2 (page 6, lines 1-11).
21	Pg 7 of 26 Line 23-24- Authors chose to omit prior hospital use a covariate. Prior hospital use can be an important predictor of future hospital use. Please report results of analyses as a supplemental file.	We fully agree that prior emergency hospital use is an important predictor of future emergency hospital use, which is why we already include prior emergency hospital use as a covariate in the main analysis. As prior hospital use may also be affected by the household context, we thought it would be useful, as a <i>sensitivity</i> analysis, to calculate the rate ratios omitting prior hospital use. These are already presented in Supplemental File 4. We have added the word 'sensitivity' to the last sentence of the section on sensitivity analysis to underline that this is just a sensitivity analysis (page 6, line 37).
22	Please specify numerical cut points for socio-economic deprivation-	Thank you, we have specified the Index of Multiple Deprivation (IMD) quintiles (page 7, line 3)

	quintiles.	
Discussion		
23	Pg 12 of 26 As above comment about living arrangement/household composition in this manuscript are risk factors for social isolation rather than proxies. Also pg 13 of 26 line 5 and 6.	Thank you, this is a very valid point that has also been raised by another reviewer. Please see the response to comment #13 above.
Conclusion		
24	Line 52 Pg 14 of 26 Please offer more thoughts and ideas about the "additional support" that is needed for study group or those like them.	We do not consider that we are in a position to suggest ways to provide additional support to informal carers, and it is likely that different informal carers would benefit from different support. However, it is possible that MDTs could be one such avenue, which is why this sentence follows the sentence on MDTs (previously page 13, lines 17-21, now moved up to page 13, lines 10-14).

### VERSION 2 – REVIEW

<b>REVIEWER</b>	Kimberley Smith University of Surrey, FHMS
<b>REVIEW RETURNED</b>	24-Mar-2022
<b>GENERAL COMMENTS</b>	I thank the authors for their carefully considered response to my review, and am happy that they have addressed all the points.