PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (**http://bmjopen.bmj.com/site/about/resources/checklist.pdf**) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

This paper was submitted to a another journal from BMJ but declined for publication following peer review. The authors addressed the reviewers' comments and submitted the revised paper to BMJ Open. The paper was subsequently accepted for publication at BMJ Open.

(This paper received three reviews from its previous journal but only two reviewers agreed to published their review.)

ARTICLE DETAILS

TITLE (PROVISIONAL)	Quality of Life, Loneliness, and Health-related Characteristics among Older People in Liaoning Province, China: A Cross-Sectional Study
AUTHORS	Zhu, Yaxin; Liu, Jie; Qu, Bo; Yi, Zhe

VERSION 1 – REVIEW

REVIEWER	Fu, Chaowei School of Public Health, Fudan University, China
REVIEW RETURNED	12-Feb-2018

GENERAL COMMENTS	Healthy aging is one of important public health problems. The relationship between loneliness and health is an interesting topic worldwide. This study was carried out in a city of China. The following questions should be addressed: Major Revision 1. How was the sample size estimated? Was it enough for this study? 2. How were those subjects sampled? How many communities were covered and selected? How many eligible subjects were targeted? Anyway, 93.4% was not a response rate. 3. What were the inclusion and exclusion criteria of subjects? 4. Near half of subjects had 6 education years or lower. How did they complete those scales by themselves? 5. Statistical methods should be improved. For example, category variables should not be treated as continuous variables in regression model. In addition, it is unreasonable that significant variables were selected into that model. 6. Why was the satisfaction for their health services one factor related to QOL? 7. The limitations should be discussed deeply and more detailed such as report bias. 8. The index of QOL was directly used in this study. What is its implication for public health? Minor Revision 9. As a cross-sectional study design, the conclusion of 'Loneliness predicted poorer QOL among elderly' is not proper. 10. The aims are different in the abstract and background.

REVIEWER	Lai, P.C. The University of Hong Kong Hong Kong, China
REVIEW RETURNED	27-Feb-2018

GENERAL COMMENTS	The study was well conducted and employed suitable measures. While there was no serious deficiency in its presentation, the paper appeared a bit bland. As the aim of the paper is to establish association between loneliness and QOL, it may be prudent to use a case-control design to examine empty nesters with chronic disease(s) and compare to controls without chronic disease(s) and matched individually to each case on age, smoking, physical activity, and income. Given a sample size of 341 empty nesters, it may be possible to better explain the effects of loneliness on QOL.

REVIEWER	Ruby Yu The Chinese University of Hong Kong
REVIEW RETURNED	01-Apr-2018

GENERAL COMMENTS	This is an intriguing manuscript with notable strengths. There were, however, several fairly important concerns: First, the paper may make a contribution to the literature, but I think the author should clarify precisely how this paper extends our knowledge. A fairly large literature has documented linkages between loneliness and older people's well-being. Second, the study has several methodological limitations including the use of cross-sectional data which prevent the delineation of causal pathways or reverse causation. Also, the author did not provide details of the sampling method. Third, I think that the main thrust of the study is about the relationship between loneliness and quality of life. I would recommend including a more thorough analysis to examine the relationship. Forth, the discussion seems rather briefly reported. Also, based on paragraph 1of the discussion, the author stated "Loneliness affected QOL even less, although it correlated negatively with QOL (β = –0.175, p < 0.05)." However, on paragraph 3 "We found loneliness to be significantly correlated with the QOL of our participants…" I would suggest rephrasing these sentences. Finally, for the conclusion, it appears somewhat premature to recommend routine screening and treatment based on a cross-sectional study. I would therefore recommend a re-write of conclusion to make the messaging more balanced.

VERSION 1 – AUTHOR RESPONSE

Reviewer #1 (Dr. Fu, Chaowei):

Healthy aging is one of important public health problems. The relationship between loneliness and health is an interesting topic worldwide. This study was carried out in a city of China. The following questions should be addressed:

Major revision:
1. How was the sample size estimated? Was it enough for this study?

Re: Thank you very much for your constructive comments. The sample size has been elaborated in the methods section.

2. How were those subjects sampled? How many communities were covered and selected? How many eligible subjects were targeted? Anyway, 93.4% was not a response rate.

Re: Thank you very much for your constructive suggestions. The detailed sampling procedure has been described in the methods section. We have recalculated the response rate (the number of complete interviews is divided by the number of interviews), and the response rate was 97.4% (764/784).

3. What were the inclusion and exclusion criteria of subjects?

Re: Thank you very much for your valuable advice. These criteria of including the participants in this study have been added in the methods section.

4. Near half of subjects had 6 education years or lower. How did they complete those scales by themselves?

Re: Thank you for your comment. All the eligible participants included in this study were able to communicate. During this survey, a questionnaire was administered by face-to-face interview to the participants by the trained investigators. If the participants have any problem with completing the survey, the investigators will assist them. We have added the detailed study procedure according to your comment.

5. Statistical methods should be improved. For example, category variables should not be treated as continuous variables in regression model. In addition, it is unreasonable that significant variables were selected into that model.

Re: Thank you very much for your constructive suggestions. Dummy variables have been set for the categorical variables, and all the independent variables were selected into the hierarchical model as you suggested. The results are shown in Table 5.

6. Why was the satisfaction for their health services one factor related to QOL?

Re: Thank you for your comment. In this study, satisfaction with health services, as one of the heath-related characteristics, was evaluated using one item from the instrument of WHOQOL-BREF. And the results of statistical analysis showed that health services satisfaction was negatively associated with QOL among elderly (p < 0.05), which was consistent with other study on Chinese elderly (Chen Y, et al., Qual Life Res 2014). The elderly who are more satisfied with their health services are more prone to regard the healthcare they receive as effective and hence adhere to the recommended treatment(s), which consequently may further improve their physical and mental health.

7. The limitations should be discussed deeply and more detailed such as report bias.

Re: Thank you very much for your constructive suggestion. It is really true as you suggested that this study has several limitations which must be acknowledged and deeply discussed. We have discussed the limitation deeply as you suggested.

8. The index of QOL was directly used in this study. What is its implication for public health?

Re: Thank you very much for your kind comment. China has the largest older population in the world (HelpAge International, Global Age Watch Index 2014). Population aging will have profound consequences for the health system in China (Shanghai Municipal Center for

Disease Control & Prevention, Study on global AGEing and Adult Health Wave 1 China National Report 2012). WHO suggested that improving quality of life (QOL) for older people should be the outcome of realizing the policy framework of "active ageing" (World Health Organization, Active ageing: a policy framework 2002). With the rapid population ageing, adding "quality" to older people's life to improve their health, social function, independence, and activity has become the goal of a prolonged life (Bowling A, Curr Gerontol Geriatr Res 2009). And these may also recommend that the health systems of disease-centered curative models should be transformed to the integrated care focusing on the needs of elderly (World Health Organization, WHO World Report on Health and Ageing 2015). Thus, QOL index assessment has recently become an essential element in the elderly care, and improving their QOL has become a priority (Bélanger E, et al., BMJ Open 2016; Cerin E, et al., BMJ Open 2016). Thus, maintaining the elderly in good QOL positively impacts both them and our public health system in China. We have elaborated the implication of QOL index assessment for the public health in the introduction section.

Minor Revision:
9. As a cross-sectional study design, the conclusion of 'Loneliness predicted poorer QOL among elderly' is not proper.

Re: Thank you very much for your valuable comment. We have revised the sentence to state, "Loneliness was negatively associated with QOL among elderly".

10. The aims are different in the abstract and background.

Re: Thank you very much for this comment. We have rewritten the aims to ensure these are aligned.

Reviewer #2 (Dr. Lai, P.C.):

1. The study was well conducted and employed suitable measures. While there was no serious deficiency in its presentation, the paper appeared a bit bland. As the aim of the paper is to establish association between loneliness and QOL, it may be prudent to use a case-control design to examine empty nesters with chronic disease(s) and compare to controls without chronic disease(s) and matched individually to each case on age, smoking, physical activity, and income. Given a sample size of 341 empty nesters, it may be possible to better explain the effects of loneliness on QOL.

Re: Thank you very much for your constructive suggestion. Empty nest has been becoming the main family pattern in old people, which account for 51.1% of the elderly in China (Zhai Y, et al., J Affect Disord 2015; Chen F, et al., Int J Environ Res Public Health 2015). So it is really true as you suggested it would be more prudent to study the relation between QOL and loneliness among empty nesters. However, our study was only an observational investigation employing a cross-sectional design to explore the relation between QOL and loneliness among the general elderly. As you suggested the further study, focusing on the specific group of elderly like empty nesters and applying more effective design like case-control design or cohort design, would be carried out to establish the casual relation between loneliness and QOL. The limitation of the study design has been added in our manuscript. Thank you once again.

Reviewer#3 (Dr. Ruby Yu):

This is an intriguing manuscript with notable strengths. There were, however, several fairly important concerns:

1. First, the paper may make a contribution to the literature, but I think the author should clarify precisely how this paper extends our knowledge. A fairly large literature has documented linkages between loneliness and older people's well-being.

Re: Thank you very much for your kind comment. It is really true as you mentioned that the relation between loneliness and QOL has been recognized among the elderly in some countries like Sweden (Jakobsson U, et al., Aging Clin Exp Res 2005) and Netherlands (Verhagen I, et al., Health Qual Life Outcomes 2014). However, only few study has assessed this relation among Chinese rural empty nest Chinese (Liu LJ, et al., Qual Life Res 2007). Compared with developed country, China has the unique national conditions and culture. Due to social and economic change in China recently, younger people have migrated or emigrated to relatively economically developed area to seek employment and a better life (Chen Y, et al., Health Soc Care Community 2014). And China is a country that values the culture of collectivism and filial piety. Older people still expected to get the care provided by their children. Therefore, the perception of the gap between expected and actual amount of support that the older people derived from their families would be stronger for elderly (Liu LJ, et al., Qual Life Res 2007). This would be the reason why Chinese elderly had serious problem of loneliness. Hence, the relation between QOL and loneliness should be fully investigated to provide some implication for proposing new interventions on improving QOL among Chinese elderly. We have elaborated this implication in the introduction section.

2. Second, the study has several methodological limitations including the use of cross-sectional data which prevent the delineation of causal pathways or reverse causation. Also, the author did not provide details of the sampling method.

Re: Thank you very much for your kind comments. This paper just made a preliminary research on exploring the relation between loneliness and QOL. The further study, applying more effective design like case-control design or cohort design, would be carried out to establish the casual relationship between loneliness and QOL. The limitation of the study design has been elaborated in the paper. In addition, the detailed sampling procedure has been described in the methods section.

3. Third, I think that the main thrust of the study is about the relationship between loneliness and quality of life. I would recommend including a more thorough analysis to examine the relationship.

Re: Thank you very much for your constructive advice. A hierarchical linear regression analysis has been performed to examine the relation. The detailed methods of the analysis are shown in method section, and the results are listed in Table 5. Thank you once again.

4. Forth, the discussion seems rather briefly reported. Also, based on paragraph 1of the discussion, the author stated "Loneliness affected QOL even less, although it correlated negatively with QOL (β = –0.175, p < 0.05)." However, on paragraph 3 "We found loneliness to be significantly correlated with the QOL of our participants…" I would suggest rephrasing these sentences.

Re: Thank you very much for your suggestion. We have reviewed the discussion carefully and rephrased this part according to your suggestion.

5. Finally, for the conclusion, it appears somewhat premature to recommend routine screening and treatment based on a cross-sectional study. I would therefore recommend a re-write of conclusion to make the messaging more balanced.

Re: Thank you very much for your constructive suggestion. We have re-written the conclusion as you suggested.

Thank you once again for your comments about the revised manuscript. They were very helpful in our revision process. If there are any further problems or mistakes in the manuscript, please feel free to contact me.

VERSION 2 – REVIEW

GENERAL COMMENTS	The authors made use of hierarchical multivariate linear regression analysis to examine the association between QOL and demographic, health-related, and loneliness variables. This revision reported much more interesting results and clarified the study limitations. More linkage between the study and previous research has made interpretation of results more credible and justified. Other than minor formatting problems (e.g., table contents and headings should not be split into two pages), the revised version is acceptable for publication.

GENERAL COMMENTS	Thank you for the revision. I have no further comment.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 2 (Lai, P.C.):

The authors made use of hierarchical multivariate linear regression analysis to examine the association between QOL and demographic, health-related, and loneliness variables. This revision reported much more interesting results and clarified the study limitations. More linkage between the study and previous research has made interpretation of results more credible and justified. Other than minor formatting problems (e.g., table contents and headings should not be split into two pages), the revised version is acceptable for publication.

Re: Thank you very much for reviewing our manuscript to improve the quality. We have proofed the whole manuscript to correct the formatting problems.

Reviewer: 3 (Ruby Yu):

Thank you for the revision. I have no further comment.

Re: Thank you very much for reviewing our manuscript to improve the quality.
Thank you once again for your comments about the revised manuscript. They were very helpful in our revision process. If there are any further problems or mistakes in the manuscript, please feel free to contact me.