PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Gender disparities in depressive and anxiety symptoms among internal migrant workers in Shenzhen: A cross-sectional study
AUTHORS	Hou, Fengsu; Liu, Hui-ming; Peng, Xiaodong; You, Liqin; Zhou, Zhijian; Xie, Haiyan; Liu, Tiebang

VERSION 1 – REVIEW

REVIEWER	Yuan-Pang Wang Department of Psychiatry University of São Paulo Medical School Brazil
REVIEW RETURNED	22-Aug-2020

GENERAL COMMENTS	BMJOPEN-2020-041446: Gender difference in depression and anxiety among migrant workers in Shenzhen: A cross-sectional study, by Hou et al., 2020. This is a cross-sectional study on mental health of migrant workers in Shenzen (n = 3095). The study randomly recruited a sample of non-hukou registered participants working in factories of the city of Shenzen. Main rating scales are PHQ-9 and GAD-7. After fitting several regression models, authors conclude that there might be a gender inequity among migrant workers. This article brings an interesting topic in several fields, the human migration and the mental health of migrants. While the manuscript is well organized in relevant sections, some of them need editing. Large sample size is a strength of the study. I have comments and suggestions to improve the manuscript. Major issues: (1) Because you applied different rating scales to record symptoms of depression and anxiety, in every instance you mention psychopathology you should add "symptoms of...". Otherwise you need have a clinical diagnosis or apply a structured interview. (2) There is a plethora of rating scales used in this article. Although the sample size is sufficiently high to account for data variance, you should highlight only PHQ-9 and GAD-7, the core symptoms of interest. Additional ULS-6, BIS-11, SSRS, SCSQ, and C-MLQ should be simplified (but not eliminated) to avoid overshadowing the core tools. Recommend shortening (30%) the portions on the description of these accessory tools in Methods(Pages 8 and 9), as well as in Results (Pages 11 and 12). Excessive numerical data have mixed up the reading flow. (3) Linking the concept of "hukou" to the identification of migrant participants is very clever (paragraph 1 and 2 of Introduction). I would re-emphasize in Discussion how this concept of "citizenship"

was related with disadvantages for migrant workers. For non-Chinese readers, the importance of this register might be overlooked.

(4) Page 7, line 3: Your data were clustered in 8 selected factories, where 400 participants were selected in each location. Have you adjusted this clustered data? Multilevel regression analysis could provide a more accurate data analysis. Page 10, line 38: what is the level of significance (p-value) adopted to select a variable to the regression models?

(5) Results: Because one of main findings of this study is the gender difference, I strongly recommend summarize all gender-related findings in a single paragraph. This will stand out the issue of gender.

(6) Table 1: I guess that the numerical data of rating scales refer to mean score and SD or SE. Please make this clear, as the information displayed is not N (%).

(7) The prevalence ratio of symptoms of depression and anxiety of 27.9% and 19.3% is unusual, because most Western surveys report higher prevalence of "depression" instead of "anxiety" symptoms. How can you explain this findings? Please elaborate.

(8) I would like to read a comprehensive Discussion about female migrants and non-hukou status of participants that are associated with several disadvantages. I would nice if you can summarize in separate paragraphs, for the sake of clarity and conciseness.

(9) In general, the Discussion is mainly focused on the situation of Chinese migrants. The worse mental health of women is not exactly a novelty, but exploring this in the perspective of internal migration is an asset. I recommend expanding the Discussion taking in account an international standpoint. Do formulate a strong final message in Conclusion. What and why would your study be interesting for non-Chinese readers? Are similar findings also observed among non-Chinese migrants? Can your findings serve as a model to understand other migration-related phenomenon worldwide? In other words, what are the learned lesson from this study?

Minor concerns:
(10) Page 6, line 26 - 27: Please make clear the concept of meta-city, that refers to human settlement over 20 million inhabitants (UN-Habitat). Do inform the latest estimate of population living in Shenzen.

(11) Please consider the distinction between "gender" and "sex". Gender refers to a socio-cultural construct, while sex is associated with biological aspects. Please revise whenever convenient, from Title to remain text.

(12) Page 7, lines 10 - 12: Please inform how many migrants were excluded, as well as the reasons of non-eligibility.

(13) Page 7, line 52: Please define schooling in terms of years of education. The categorization into "primary", "junior high", "high" and "college" could be different in China and the US.

(14) Page 10, line 19: Please convert the Chinese currency Yuan into US dollar or EU euro. Some readers could find difficulties to appreciate this variable.

(15) Page 13: Do eliminate "As showed in Table 2". This expression is just a distractor to Table 4. Instead, you can start this paragraph with something like "Table 4 shows ....". Also, do delete the final mention on Table 4 (page 16, line 40).

(16) Table 3 and 4: Please make clear what is the meaning of each of the Models. You could place a footnote explanation for adjustments. Tables should stand alone and be self-explanatory without reading the text.

| | (17) The manuscript needs a professional editing by a native English speaker. Inappropriate word use, misspellings, typos and grammar agreement are some problems to fix. |

REVIEWER	Assoc. Prof. Orawan Kaewboonchoo Faculty of Public Health, Mahidol University, Thaialnd
REVIEW RETURNED	10-Sep-2020

GENERAL COMMENTS	This paper is very interested. I have some concerns as follow. 1. The prevalence of depression and anxiety was not shown in Table 1. 2. This study found the gender differences in prevalence of depression and anxiety among migrant workers, Do you think that factors related to depression and anxiety may be different among male and female? 3. Work related factors may affect to depression or anxiety of migrant workers. This is may be the limitation of this study.

REVIEWER	Anna Gkiouleka University of York, United Kingdom
REVIEW RETURNED	14-Sep-2020

GENERAL COMMENTS	General Comments The manuscript needs proof-reading for grammatical and vocabulary corrections. It should be clarified in title and abstract that the study focuses on internal migrants. Gender as a social construct and the related socio-economic differences between men and women in the context should be discussed in the introduction in the same way they are discussed in the discussion. In the tables, usually the p is given with an indication for each variable. It is not really clear through the manuscript whether and to what extent the associated factors examined explain the observed gender differences in depression and anxiety. Abstract Objectives It is not clear whether gender differences refer to prevalence rates, explanatory mechanisms or severity of symptoms of depression and anxiety. Participants A short explanation of Hukou system would be helpful for international audiences e.g. household registration system or what the authors find relevant. Methods Authors should report which were their variable of interest and how they constructed them besides the questionnaires used. Results The authors mention depression, anxiety and then mental health, it is not clear how mental health is used (i.e. does it involve both depression & anxiety or it involves other dimensions as well). It will be helpful if they stick to the same definitions and terms and/or define mental health for consistency. Also, they mention a series of

dimensions (i.e. demographics, health related behaviours and well-being) but it is not clear why and how these dimensions are included in the study.

Conclusion
Usually in this type of studies the term inequality is preferred instead of inequity, because the latter is not really measurable. Gender inequality is suggested as an institutional factor leading to disparities, however from the abstract the reader cannot understand whether gender inequality is operationalised as a structural factor in the analysis.

Manuscript
Introduction
Aim 2 (lines 40-42) should be clarified.

Methods
Sample & Sampling
The parent study's name should be mentioned as well as the original sample size of the parent study.

Analytic plan
The authors should mention:
i) How dummy variables were constructed.
ii) What were the potential associated variables.
ii) Details of univariate regressions.
iv) Details of multivariate analyses (baseline model, explanatory variables, covariates etc).

Patient and Public Involvement
This section should be rephrased (proof-read).

Results
On p. 14, lines 34-60, the units mentioned here are not easy for the reader to grasp. Maybe try to rephrase to make it more comprehensible. Given that the authors used cut-off points for the scales used, it might be easier for the reader to understand how the examined associated factors where likely to increase depression from mild to moderate, or from moderately severe to severe. One unit increase in the scale does not say much in real life terms. The same applies for the anxiety results in the following page.

p.18 lines 10-15, the comparison with the local residents is not justified or supported by the provided evidenc

VERSION 1 – AUTHOR RESPONSE

Responses to Reviewer 1:
Major issues:
1. Because you applied different rating scales to record symptoms of depression and anxiety, in every instance you mention psychopathology you should add "symptoms of...". Otherwise you need have a clinical diagnosis or apply a structured interview.
Response: Thank you for the comment. We acknowledge that, instead of diagnostic tools, both the PHQ-9 and GAD-7 are screening tools for depressive and anxiety symptoms. Now we have revised the expression as "depressive symptoms" and "anxiety symptoms" throughout the manuscript.

2. There is a plethora of rating scales used in this article. Although the sample size is sufficiently high to account for data variance, you should highlight only PHQ-9 and GAD-7, the core symptoms of interest. Additional ULS-6, BIS-11, SSRS, SCSQ, and C-MLQ should be simplified (but not eliminated) to avoid overshadowing the core tools. Recommend shortening (30%) the portions on the description of these accessory tools in Methods (Pages 8 and 9), as well as in Results (Pages 11 and 12). Excessive numerical data have mixed up the reading flow.

Response: Thank you for the comment. The advice is quite valuable. Now we have simplified the "Methods" and "Results" sections on Page 8 Line 4 to Line 25 and Page 9 Line 1 to Line 15

3. Linking the concept of "hukou" to the identification of migrant participants is very clever (paragraph 1 and 2 of Introduction). I would re-emphasize in Discussion how this concept of "citizenship" was related with disadvantages for migrant workers. For non-Chinese readers, the importance of this register might be overlooked.

Response: Thank you for the advice. Now we have provided the social context of the "hukou" system in China in Discussion on Page 17 Line 13 to Line 21.

4. Page 7, line 3: Your data were clustered in 8 selected factories, where 400 participants were selected in each location. Have you adjusted this clustered data? Multilevel regression analysis could provide a more accurate data analysis. Page 10, line 38: what is the level of significance (p-value) adopted to select a variable to the regression models?

Response: Thank you for the comment. During sample size calculation, the parent study considered clustering effect. Now we have run multilevel linear regression analysis to provide a more accurate results, and we have updated the "Methods", "Results" and "Discussion", as well as tables, based on the latest results.

We have provided the level of significance adopted to select a variable to the regression models (p<0.05) on Page 10 Line 13 to 14.

5. Results: Because one of main findings of this study is the gender difference, I strongly recommend summarize all gender-related findings in a single paragraph. This will stand out the issue of gender.

Response: Thank you for the comments. We did have one sing paragraph in the manuscript to summarize all gender-related findings on Page 11 Line 19 to 25 and Page12 Line1 to 2.

6. Table 1: I guess that the numerical data of rating scales refer to mean score and SD or SE. Please make this clear, as the information displayed is not N (%).

Response: Thank you for the comment. Now we have revised this in Table 1.

7. The prevalence ratio of symptoms of depression and anxiety of 27.9% and 19.3% is unusual, because most Western surveys report higher prevalence of "depression" instead of "anxiety" symptoms. How can you explain this findings? Please elaborate.

Response: Thank you for the comment. In this study, the results are consistent with findings from Western studies that the prevalence of depressive symptoms is higher than the prevalence of anxiety symptoms. For example, Hovey and Magana reported the prevalence of depression and anxiety among American Mexican immigrant farmworkers is 37.8% and 28.9%[1]; Breslau and colleagues also reported the prevalence of depressive and anxiety disorders among Mexico to the United States migrants is 11.0% and 10.1%[2]. Similar findings are also reported by studies form Sweden[3] and Finland[4]. However, most of the Western studies are focusing on international, instead of internal, migrant workers, and there are a proportion of these international workers are refugees or under documented migrants. We hypothesize that the immigration status would associate with depressive and anxiety symptoms and there might be differences in the severity of depressive and anxiety symptoms between internal and international migrant workers, and the hypothesis need to be tested by future studies.

References
1. Hovey J D, Magaña C. Acculturative stress, anxiety, and depression among Mexican immigrant

farmworkers in the Midwest United States[J]. Journal of Immigrant Health, 2000, 2(3): 119-131.

2. Breslau J, Borges G, Tancredi D, et al. Migration from Mexico to the United States and Subsequent Risk for Depressive and Anxiety Disorders: A Cross-National Study. Arch Gen Psychiatry. 2011, 68(4):428–433.

3. Andersson, L., Hjern, A. & Ascher, H. Undocumented adult migrants in Sweden: mental health and associated factors. BMC Public Health, 2019, 18:1369

4. Rask S, Suvisaari J, Koskinen S, et al. The ethnic gap in mental health: A population-based study of Russian, Somali and Kurdish origin migrants in Finland. Scandinavian Journal of Public Health. 2016, 44(3):281-290.

8. I would like to read a comprehensive Discussion about female migrants and non-hukou status of participants that are associated with several disadvantages. I would nice if you can summarize in separate paragraphs, for the sake of clarity and conciseness.

Response: Thank you for the advice. Now we have provided information related to the disadvantages hukou status of participants on Page 17 Line 13 to 21. After re-analyzing based on your advice on the clustered data, we did not find the association between gender and the severity of depressive or anxiety symptoms, hence we did not further discussion on this point. Instead, we discussed gender as an institutional factor of mental health among internal migrant workers in the socioecological framework on Page 19 Line 2 to 19.

9. In general, the Discussion is mainly focused on the situation of Chinese migrants. The worse mental health of women is not exactly a novelty, but exploring this in the perspective of internal migration is an asset. I recommend expanding the Discussion taking in account an international standpoint. Do formulate a strong final message in Conclusion. What and why would your study be interesting for non-Chinese readers? Are similar findings also observed among non-Chinese migrants? Can your findings serve as a model to understand other migration-related phenomenon worldwide? In other words, what are the learned lesson from this study?

Response: Thank you for the advice. Now we have provided discussion about the internal migration (the effects of "Hukou" system) for international readers on Page 17 Line 13 to 21, and we have also provided a strong final message in Conclusion on Page 20 Line 11 to 15.

Minor concerns:

10. Page 6, line 26 - 27: Please make clear the concept of meta-city, that refers to human settlement over 20 million inhabitants (UN-Habitat). Do inform the latest estimate of population living in Shenzen.

Response: Thank you for the comment. The permanent population at the year-end is 13.02 million according to the Shenzhen Statistic Yearbook (2019), despite there are research reports indicating the total population of Shenzhen is over 22 million including permanent and non-permanent inhabitants, we decide to revise the description based on the yearbook on Page 6 Line 12 to 14.

11. Please consider the distinction between "gender" and "sex". Gender refers to a socio-cultural construct, while sex is associated with biological aspects. Please revise whenever convenient, from Title to remain text.

Response: Thank you for the comment. Now we have revised this through the manuscript.

12. Page 7, lines 10 - 12: Please inform how many migrants were excluded, as well as the reasons of non-eligibility.

Response: Thank you for the comment. We have included the exclusion criteria on Page 7 Line 14 to 15 in the Methods section. However, we did not know how many migrant workers were approached during recruitment.

Now we have specified there were 105 participants who were not eligible for the analysis, and the reasons for non-eligibility on Page 10 Line 22 to 24. The differences of sociodemographic information between eligible and non-eligible participants were not significant.

13. Page 7, line 52: Please define schooling in terms of years of education. The categorization into "primary", "junior high", "high" and "college" could be different in China and the US.
Response: Thank you for the comment. Now we have defined schooling in terms of years of education to explain the categorization of "primary", "junior high", "high" and "college" in the Methods section on Page 9 Line 21 to 23.

14. Page 10, line 19: Please convert the Chinese currency Yuan into US dollar or EU euro. Some readers could find difficulties to appreciate this variable.
Response: Thank you for the comment. Now we have converted the Chinese currency Yuan into US dollar through the manuscript.

15. Page 13: Do eliminate "As showed in Table 2". This expression is just a distractor to Table 4. Instead, you can start this paragraph with something like "Table 4 shows ....". Also, do delete the final mention on Table 4 (page 16, line 40).
Response: Thank you for the advice. Now we have revised the expression on Page 13 Line 2 to 7, Page 14 Line 7 to 17, and Page 15 Line 6 to 10 and Line 16 to17.

16. Table 3 and 4: Please make clear what is the meaning of each of the Models. You could place a footnote explanation for adjustments. Tables should stand alone and be self-explanatory without reading the text.
Response: Thank you for the advice. Now we have provided footnotes to explain the meaning of the Models in Table 3 and Table 4.

17. The manuscript needs a professional editing by a native English speaker. Inappropriate word use, misspellings, typos and grammar agreement are some problems to fix.
Response: Thank you for the advice. Now we have revised the writing with assistance from a native English speaker.

Responses to Reviewer 2:
1. The prevalence of depression and anxiety was not shown in Table 1.
Response: Thank you for the comment. Now we have shown the prevalence of depressive and anxiety symptoms in Table 1.

2. This study found the gender differences in prevalence of depression and anxiety among migrant workers. Do you think that factors related to depression and anxiety may be different among male and female?
Response: Thank you for the comment. We do believe the associated factors of depression and anxiety may be difference among males and females in the Chinese cultural context, for example we also believe female migrant workers in childbearing age are facing with the stress with reproduction after China ended the one-child policy. However, this study focused on the factors that may be associated with the severity of depression and anxiety.

3. Work related factors may affect to depression or anxiety of migrant workers. This is may be the limitation of this study.
Response: Thank you for the comment. Empirical studies do report work related stress/factors are associated with depression and anxiety of migrant worker, and the parent study did not collect these factors. Now we have listed this limitation on Page 20 Line 2.

Responses to Reviewer 3:
General Comments:
1. The manuscript needs proof-reading for grammatical and vocabulary corrections.

Response: Thank you for the comment. Now we have revised thorough the manuscript.

2. It should be clarified in title and abstract that the study focuses on internal migrants.
Response: Thank you for the comment. Now we have clarified this in title and abstract.

3. Gender as a social construct and the related socio-economic differences between men and women in the context should be discussed in the introduction in the same way they are discussed in the discussion.
Response: Thank you for the comment. We have mentioned women were in increased risk for mental health problems on Page 5 Line 20 to Page 6 Line 10.

4. In the tables, usually the p is given with an indication for each variable.
Response: Thank you for the comment. In this study, we applied linear regression analysis and we provided the 95% confidence interval (95%CI) in tables. For the coefficient of each variable, if its range of 95%CI contains zero, the given p value would be larger than the significant level 0.05. Hence, we did not provide p values in tables.

5. It is not really clear through the manuscript whether and to what extent the associated factors examined explain the observed gender differences in depression and anxiety.
Response: Thank you for the comment. After re-analysis after reviewer 1's comment, we found gender did not associate with the severity of depressive and anxiety symptoms. Instead, we found gender differences among factors that associated with the severity of depressive and anxiety symptoms, we discussed the findings based on the social ecological framework.
Abstract:
1. It is not clear whether gender differences refer to prevalence rates, explanatory mechanisms or severity of symptoms of depression and anxiety.
Response: Thank you for the comment. Now we have clearly stated the gender differences refer to the prevalence and severity of depressive and anxiety symptoms.

2. A short explanation of Hukou system would be helpful for international audiences e.g. household registration system or what the authors find relevant.
Response: Thank you for the comment. Now we have replaced "Hukou" system with household registration system in the abstract.

3. The authors mention depression, anxiety and then mental health, it is not clear how mental health is used (i.e. does it involve both depression & anxiety or it involves other dimensions as well). It will be helpful if they stick to the same definitions and terms and/or or define mental health for consistency. Also, they mention a series of dimensions (i.e. demographics, health related behaviours and well-being) but it is not clear why and how these dimensions are included in the study.
Response: Thank you for the comment. Now we have used the term depressive and anxiety symptoms instead of mental health in this manuscript.

4. Usually in this type of studies the term inequality is preferred instead of inequity, because the latter is not really measurable. Gender inequality is suggested as an institutional factor leading to disparities, however from the abstract the reader cannot understand whether gender inequality is operationalised as a structural factor in the analysis.
Response: Thank you for the comment. We totally agree with you that gender inequality is more appropriate, and now we have used the term "gender inequality" through the manuscript.

Manuscript:
1. Introduction Aim 2 (lines 40-42) should be clarified.
Response: Thank you for the comment. Now we have clarified Aim 2 on Page 6 Line 20 to 21.

2. The parent study's name should be mentioned as well as the original sample size of the parent study.
Response: Thank you for the comment. Now we have listed the name of the parent study in Introduction on Page 6 Line 15x to 16. We have also clarified the sample size of the parent study in Methods from Page 6 Line 25 to Page 7 Line 8.

3. The authors should mention: i) How dummy variables were constructed. ii) What were the potential associated variables. ii) Details of univariate regressions. iv) Details of multivariate analyses (baseline model, explanatory variables, covariates etc).
Response: Thank you for the comment.
i) We have provided information on how we construct dummy variables on Page 10 Line 5 to 6.
ii) We have provided information on potential associated variables on Page 10 Line 10 to 11.
iii) We have provided information on univariate regressions on Page 10 Line 7 to 11.
iv) We have provided information on multivariate regressions on Page 10 Line 11 to 16.

4. Patient and Public Involvement This section should be rephrased (proof-read).
Response: Thank you for the comment. Now we have revised this section on Page 10 Line 19.

5. On p. 14, lines 34-60, the units mentioned here are not easy for the reader to grasp. Maybe try to rephrase to make it more comprehensible. Given that the authors used cut-off points for the scales used, it might be easier for the reader to understand how the examined associated factors where likely to increase depression from mild to moderate, or from moderately severe to severe. One unit increase in the scale does not say much in real life terms. The same applies for the anxiety results in the following page.
Response: Thank you for the comment. In this study, we applied linear regression to explore factors that may associate with the severity of depressive and anxiety symptoms, and the estimates were the coefficients of variables which illustrated the direction and the degree of change of the severity of depressive/anxiety symptoms. During revision, we did not find cut-off points for scales we used to re-code continuous variable as category variables; meanwhile, despite there were cut-off points for the PHQ-9 and GAD-7 for none, mild, moderate and severe degrees, in linear regression analysis the coefficients of variables would still be interpreted as how the severity of the dependent variable would change if an independent variable changes one unit. Therefore, we did not recode the dependent variable for analysis.

6.·p.18 lines 10-15, the comparison with the local residents is not justified or supported by the provided evidence
Response: Thank you for the comment. We agree with you that the comparison of prevalence with residents is not justified by the provided evidence. In this study, we reported the mean score of PHQ-9 and GAD-7 was 3.31 and 2.30, respectively. In provided evidence, the mean score of PHQ-9 and GAD-7 among residents was 2.46 and 1.91, which was lower than our results1,2. Meanwhile, the prevalence of depressive and anxiety symptoms among internal migrant workers in the study was higher than that among both residents and non-residents in Shenzhen reported by a previous study2. We have revised this paragraph from Page 17 Line 22 to Page 18 Line 9.
References
1. Wang W. Psychological Health Status in Seven Provinces in China and Brief Intervention for Alcohol Abuse. Shanghai Jiao Tong University, 2014.
2. Hu J, Hu C, Duan W, et al. Survey on mental disorders among registered residents and non-registered residents in Shenzhen Chinese Journal of Epidemiology 2009;30(6):543-48.

VERSION 2 – REVIEW

REVIEWER	Yuan-Pang Wang Department & Institute of Psychiatry, University of São Paulo Medical School, São Paulo SP, Brazil
REVIEW RETURNED	11-Oct-2020

GENERAL COMMENTS	Authors have addressed all my previous concerns. Thank you for the opportunity of reviewing this interesting study! Congratulations.

REVIEWER	Anna Gkiouleka University of York, UK
REVIEW RETURNED	13-Oct-2020

GENERAL COMMENTS	I find that the authors have worked on the reviewers comments. The paper addresses an important issue and evidence from China is very valuable at this point in any health related topic. The flow of the manuscript has improved a lot. Still, I think a final round of proof-reading is needed before publication.

VERSION 2 – AUTHOR RESPONSE

Responses to Reviewer 1:

1. Authors have addressed all my previous concerns. Thank you for the opportunity of reviewing this interesting study! Congratulations.

Response: Thank you for reviewing our work, your comments are very helpful for us to improve the quality of this manuscript.

Responses to Reviewer 3:

1. I find that the authors have worked on the reviewers comments. The paper addresses an important issue and evidence from China is very valuable at this point in any health related topic. The flow of the manuscript has improved a lot. Still, I think a final round of proof-reading is needed before publication.

Response: Thank you for reviewing our work, your comments are very helpful for us to improve the quality of this manuscript. Now we have finished a final round of proof reading and revised this manuscript.