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.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Anxiety levels, precautionary behaviors and public perceptions during the early phase of the COVID-19 outbreak in China: a population based cross-sectional survey
AUTHORS	Qian, Mengcen; Wu, Qianhui; Wu, Peng; Hou, Zhiyuan; Liang, Yuxia; Cowling, Benjamin; Yu, Hongjie

VERSION 1 – REVIEW

REVIEWER	Sujita Kumar Kar King George's Medical University, Lucknow, India
REVIEW RETURNED	03-Jun-2020

GENERAL COMMENTS	• Whether the interviews are conducted by same person or different persons? • The authors need to explain about confidentiality, data protection as they have mentioned that call recording was done? • What intervention was done to those people who reported moderate to severe anxiety? • What with those individuals who had history of any psychiatric disorder? Whether they were also evaluated in the analysis? • The figure shows that there is drastic increase in number of cases / deaths due to COVID-19 between 1st Feb to 10th Feb. It is likely to bias study findings. Statistics of mortality and morbidity influence anxiety levels. The individuals who reported less anxiety on Feb 1 may report anxiety by seeing the increasing figures in subsequent time period.

REVIEWER	Abram Wagner University of Michigan, USA
REVIEW RETURNED	08-Jun-2020

GENERAL COMMENTS	The introduction just needs a little more tying everything together. You are trying to link together anxieties, risk perceptions, and behaviors. A sentence or two describing the hypothetical linkage Section 2.1: could you describe if you obtained ethical review approval or were exempted (for a specific reason) Section 2.6: how did you create your multivariable models? Did you adjust models based on a priori consideration of confounders? (or did you use stepwise selection of variables, or only include variables whose p-value was below a certain number in unadjusted model, etc.?) For Table S3 you do mention each column is a separate model. Is there a reason you did it that way in stead of separate models for different perception factors. I'm potentially concerned that there could be interrelationships between the perception factors.

	Section 2.7 - this section should be about whether members of the community were consulted when you were constructing questionnaire (or making sample, etc.). As it is, I don't think they were, which is fine, but you should mention such https://blogs.bmj.com/bmjopen/2018/03/23/new-requirements-for-patient-and-public-involvement-statements-in-bmj-open/ Do you think worse behaviors in men vs women could impact greater incidence of disease in men?

REVIEWER	Gabriel Ling Hoh Teck Department of Urban and Regional Planning, Faculty of Built Environment and Surveying, Universiti Teknologi, Malaysia
REVIEW RETURNED	17-Jun-2020

GENERAL COMMENTS	General comments: Overall, the paper is well written, systematic and well organised. Problem statement and research gap are well justified. Some of the findings are rather interesting and this study is timely especially in the time of the COVID-19 pandemic. Methodology is fine using the logistic regression and other inferential and descriptive analyses. However, there are some major issues: (i) Lack of a literature review or theoretical/conceptual framework (linking all the perceived factors, behavioural responses, etc.); this is one of the biggest issues, therefore leading to second issue on the discussion (ii) Despite the robust analyses executed leading to some findings that focus on associative correlations of perceptions and behavioural responses, the discussions, perhaps are lacking in this study. This is a vital part to showcase the contribution of this study by illustrating similarities with, or differences from, other related studies. Here are some minor issues: Some restructuring of headings is necessary, e.g., under the big heading 3, and subheading of 3.1 (see 8, line 54), this part to me should be in 2.1 and same goes to 2.7. English is fine but with some grammatical errors, as indicated in the attached file. See the following: page 3, line 14: It should be "digit" rather than "digital"? Page 4, line 31: This is unclear. What did the authors mean by the basis of interest in the topic? and why is that? Page 5, line 42-44: perhaps to be more complete, a statement or research gap pertaining to anxiety levels among the Chinese should also be put in the statement. Page 6, line 9: the word "public responses", "I would suggest to change it to "public precautionary responses" or another analogous term precautionary behaviours. Page 9, Line 35: "...for which city?"

	And there are some minor comments. Please find attached for the authors' reference and further actions. Good luck in your revisions! The reviewer provided a marked copy with additional comments. Please contact the publisher for full details.

VERSION 1 – AUTHOR RESPONSE

Reviewer #1

1. Whether the interviews are conducted by same person or different persons?

The interviews were conducted by the investigation team. Although it was done by different persons, all interviewers were well-trained and we confirmed the interview quality by reviewing recorded audios. We described these information in the second paragraph of section 2.1 on page 5…

"The survey was conducted by well-trained interviewers …"
"Calls were monitored and reviewed to assure the interview quality."

2. The authors need to explain about confidentiality, data protection as they have mentioned that call recording was done?

We thank the reviewer for this suggestion. We now added the following information to the second paragraph of section 2.1 on page 6…

"Participants were assigned an anonymous code based on their recruitment orders. Only members of the research team were authorized to access the data. All recorded audios will be confidentially destroyed after the completion of this study."

3. What intervention was done to those people who reported moderate to severe anxiety?

We conducted a population based cross-sectional survey. No intervention was done to people who reported moderate to severe anxiety. We described the type of our study in the title and the first sentence of section 2.1 on page 5.

4. What with those individuals who had history of any psychiatric disorder? Whether they were also evaluated in the analysis?

We did not collect information about personal health history. Participants were recruited as long as they were able to understand the questions, above 18 years old, and currently living in the two study cities. In case there were someone who had history of any psychiatric disorder in our sample, they were also evaluated in the analysis.

5. The figure shows that there is drastic increase in number of cases/deaths due to COVID-19 between 1st Feb to 10th Feb. It is likely to bias study findings. Statistics of mortality and morbidity influence anxiety levels. The individuals who reported less anxiety on Feb 1 may report anxiety by seeing the increasing figures in subsequent time period.

We thank the reviewer for raising this point. In order to check the robustness of our results, we added linear time trend (a variable equals 1 for day one of the survey, and 2 for day two, and etc.) in the regressions to capture increasing disease exposures. We obtained qualitatively similar results. We

now included this comment in the last paragraph of the discussion section on page 15…

“Fourth, our sample spanned a period where number of cases due to COVID-19 increased drastically, which may lead to an underestimation bias in the prevalence of anxiety and precautionary behaviors. We conducted robustness checks by including linear time trend in the regressions and found that results were qualitatively similar (results available upon requests). ”

Reviewer #2
1. The introduction just needs a little more tying everything together. You are trying to link together anxieties, risk perceptions, and behaviors. A sentence or two describing the hypothetical linkage.

We thank the reviewer for this suggestion. We now added two sentences to describe the hypothetical linkage among precautionary behaviors, anxiety, and public perception. We now have on page 5…

“Identifying factors of precautionary behavior and anxiety that can be intervened by policy is helpful for containing outbreaks and preventing public overreaction. Previous studies have shown that the two outcomes are associated with perceived efficacy of recommended behaviors and risk perception of diseases.5,7,11 ”

2. Section 2.1: could you describe if you obtained ethical review approval or were exempted (for a specific reason)

We followed the submission guidelines of BMJ Open and provided this information at the end of the manuscript in the separate section “Ethical approval” on page 16.

3. Section 2.6: how did you create your multivariable models? Did you adjust models based on a priori consideration of confounders? (or did you use stepwise selection of variables, or only include variables whose p-value was below a certain number in unadjusted model, etc.?) For Table S3 you do mention each column is a separate model. Is there a reason you did it that way instead of separate models for different perception factors. I'm potentially concerned that there could be interrelationships between the perception factors.

We adjust the multivariable models based on a prior consideration of confounders. Personal variables included in the regressions were sex, age ,working status, perceived household income level, whether experienced symptoms (cough and fever) during the past two weeks, whether has friends or relatives with symptoms in the past two weeks, and whether there had been confirmed or suspected cases of COVID-19 in their neighborhoods.
There was a typo in the previous version of the manuscript. We ran separate models for different perception factors to produce Table S3. We now revised the footnote: “Each column of each row presents a separate multivariate logistic regression result.” We thank the reviewer for the catch.

3. Section 2.7 - this section should be about whether members of the community were consulted when you were constructing questionnaire (or making sample, etc.). As it is, I don't think they were, which is fine, but you should mention such https://blogs.bmj.com/bmjopen/2018/03/23/new-requirements-for-patient-and-public-involvement-statements-in-bmj-open/

We thank the reviewer for raising this point. We now revised section 2.7 to indicate this information…

“…This research was done without patient involvement. Patients were not involved in the development of the research question and outcome measures, or design, recruitment, conduct, and writing of the study. ”

4. Do you think worse behaviors in men vs women could impact greater incidence of disease in men?

We agreed with the reviewer that lower prevalence of precautionary behaviors among men might have thrown them at higher risks during the COVID-19 outbreak. However, it may equal well be that what matters is the nature of the disease. If men are more susceptible to the virus, then we may overstate the impact of behaviors. Since our study did not provide direct linkage between behavior and incidence, we chose to leave this issue for future work.

Reviewer #3
1. Lack of a literature review or theoretical/conceptual framework (linking all the perceived factors, behavioural responses, etc.); this is one of the biggest issues, therefore leading to second issue on the discussion

We thank the reviewer for the comment. We now briefly added two sentences in the last paragraph of section 1 to describe the hypothetic linkage among perceived factors, behavioral response, and anxiety levels. We now have on page 5…

"Identifying factors of precautionary behavior and anxiety that can be intervened by policy is helpful for containing outbreaks and preventing public overreaction. Previous studies have shown that the two outcomes are associated with perceived efficacy of recommended behaviors and risk perception of diseases.5,7,11 "

2. Despite the robust analyses executed leading to some findings that focus on associative correlations of perceptions and behavioural responses, the discussions, perhaps are lacking in this study. This is a vital part to showcase the contribution of this study by illustrating similarities with, or differences from, other related studies.

In the original submission of the manuscript, we compared our findings with the literature in paragraphs 2-4 in section 4 "Discussion". For example,

on page 12 :
"The prevalence of moderate or severe anxiety has been 4-5 times of its normal level in urban China"
"These results contradict to findings in UK during the influenza A(H1N1)pdm09 pandemic,7 but are much sizeable than those in Hong Kong during SARS and influenza A(H1N1). 4,8,10"

on page 13:
"…we also found evidence for unwarranted precautionary behavior in coping with a novel disease, which was less documented in the literature.5"
"…compared with studies regarding other diseases, we documented higher perceived susceptibility and severity in the case of COVID-19…."

We now added the third paragraph of section 4 to include a discussion on the correlations of perception and behavioral responses. We now wrote on page 12-13…

"Consistent with previous study, our results showed that perceived harm and information reliability were significantly associated with higher anxiety levels.7 Perceived transmissibility was positive predictor of taking strict personal precautionary measures. However, our findings further showed that in the case of the COVID-19 outbreak in China, information reliability were not significantly associated with precautionary behaviors and only perceived efficacy of wearing a face mask were significantly associated with the corresponding behavior. We did not observe similar association for handwashing."

3. Some restructuring of headings is necessary, e.g., under the big heading 3, and subheading of 3.1

(see 8, line 54), this part to me should be in 2.1 and same goes to 2.7.

We agreed with the reviewer that contents under subheading 3.1 “Sample characteristics” and in section 2.7 are related with those in section 2.1. However, we chose to follow the structure of most published articles in BMJ Open (for example, Libermann, Witte & Prell, 2020) and the submission guidelines of the journal (A separate section “patient and public involvement” is required by the journal).
Reference: Liebermann JD, Witte OW, Prell T. Association between different copying styles and health-related quality of life in people with Parkinson’s disease: a cross-sectional study. BMJ Open, 2020; 10: e036870.

4. English is fine but with some grammatical errors, as indicated in the attached file. See the following: page 3, line 14: It should be "digit" rather than "digital"?

We thank the reviewer for the catch. We now used “digit” instead of “digital” throughout the manuscript.

Page 4, line 31: This is unclear. What did the authors mean by the basis of interest in the topic? and why is that?

Once our calls were picked up, we first gave a brief introduction of the study topic and then obtained informed consent from the participants. To the extent that people who chose not to participant in the study had made the decisions due to a distaste for the topic (perhaps because of distress or anxiety), we may encounter a non-response bias. We now clarified on page 4 in the last bullet point:

“….participants were informed of the survey topic before consent had been obtained, which may compromise the findings due to nonresponse bias on the basis of interest in the topic. ”

Page 5, line 42-44: perhaps to be more complete, a statement or research gap pertaining to anxiety levels among the Chinese should also be put in the statement.

We now added three additional citations to describe the current research focus regarding mental health outcomes during the COVID-19 outbreak. We now wrote on page 4:

“Recent studies have focused on mental health status among healthcare workers and patients during the COVID-19 outbreak.17,18,19 However, little is known about precautionary and psychological responses among the Chinese general population, which may be different from usual days or responses to previous disease outbreaks owing to two main reasons.”

Page 6, line 9: the word "public responses", "I would suggest to change it to "public precautionary responses" or another analogous term precautionary behaviours.

We thank the reviewer for raising this point. However, on a second thought, we chose to maintain the word “public response” as we referred to both precautionary behaviors and psychological responses.

Page 9, Line 35: "...for which city?"

On page 9, we added the name of the city in parentheses after the numbers. Now we have, “However, only 35.5% (Shanghai)-37.0% (Wuhan) residents followed the WHO recommendation, ….”

VERSION 2 – REVIEW

REVIEWER	SK Kar King George's Medical University, Lucknow, India
REVIEW RETURNED	25-Jul-2020

GENERAL COMMENTS	There is nothing new in this article. There are so many papers that evaluated similar domains.

REVIEWER	Gabriel ling Universiti Teknologi Malaysia
REVIEW RETURNED	02-Aug-2020

GENERAL COMMENTS	The paper has been satisfactorily revised however it would be better if authors could provide a Conceptual framework in the method section as a summary grouping and linking all the variables eg anxiety level, hand washing, etc. This can be better illustrated in a graphic form

VERSION 2 – AUTHOR RESPONSE

Reviewer #1
There is nothing new in this article. There are so many papers that evaluated similar domains.

We thank the referee for providing us a chance to further present the contribution of our work. In the following we illustrate our main points:
First, although studies have explored on this topic with previous epidemics (e.g., SARS, H1N1, H7N9), public responses varies by diseases and cultural settings. During the COVID-19 outbreak, China (as the first country discovered the disease) has faced with highly inconsistent information and government engagement at all levels has been strong. These two factors may contribute to different psychological and behavioral responses in the public, making this issue worth investigating. The results may also provide important insights for China as well as other countries when combating other infectious diseases in the future. (We discussed this point in the second and third paragraphs on page 4.)
Second, we searched PubMed and Web of Science for articles published up to August 25, 2020 using the terms “coronavirus”, “CoV”, “2019-nCoV”, “psychology”, “behavior”, “perception”, “cognition”, “mental”, and “China”. Most studies have focused on mental health status among healthcare workers and patients during the outbreak. We found only three studies investigated psychological responses among the general Chinese population. Of these, two studies used open online survey and respondent-driven sampling methods to collect data; one study examined posts on social media and performed sentiment analysis. We found no studies with a focus on precautionary behaviors. Accordingly, our work contributes by presenting evidence with a wide range of public behavioral responses and using demographically representative samples. (We discussed this point in the third paragraph on page 4 and in section 2.1.)
Third, our findings yielded important policy implications. We found evidence for unwarranted precautionary behavior (goggle purchase), which was less documented in the literature. Our results also suggest low awareness of hand hygiene in China, which was less discussed in previous studies. (We discussed this point on pages 13-14.)

Reviewer #3
The paper has been satisfactorily revised however it would be better if authors could provide a Conceptual framework in the method section as a summary grouping and linking all the variables e.g.

anxiety level, hand washing, etc. This can be better illustrated in a graphic form.

We thank the referee for this comment. We now added a figure in the supplementary (Figure S2) to group and link all the variables collected in this study. We also reproduced in Figure R1 in this response letter. We now wrote in Section 2.6 “Analyses” on page 8:

“Figure S2 summarizes all variables collected in this study and presents hypothetical links among psychological and behavioral outcomes, perception variables, and personal characteristics.”