

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)	Mediating effect of health consciousness in the relationship of lifestyle and suboptimal health status: A cross-sectional study involving Chinese urban residents
AUTHORS	xue, yunlian; liu, guihao; Feng, Yefang; Xu, Mengyao; Jiang, Lijie; Lin, Yuanqi; Xu, Jun

VERSION 1 – REVIEW

REVIEWER	Tao Xu School of Basic Medicine, Peking Union Medical College, China
REVIEW RETURNED	08-Jun-2020

GENERAL COMMENTS	<p>1 : '3969 residents age 14 and older' participated in this research. Why did both adolescents and adults researched in one article? Adolescents and adults have different physical and psychological conditions. Authors should study adolescents and adults respectively?</p> <p>2: The four-stage stratified sampling method should clarify more clearly.</p> <p>3: Only 3535 urban residents were analyzed in three provinces. No rural residents were selected. Is it representative for Chinese population?</p> <p>4: Sample size calculation method in this article was to estimate the prevalence of SHS, was not appropriate for the main purpose of this study.</p> <p>5: In multi-stage sampling, survey data have a hierarchical structure in which individuals were nested within higher level sampling units. Individual SHS was determined by not merely individual characteristics as well as features of the social environments in which individuals live. The authors should use more appropriate analysis method to control the cluster effect of living circumstances.</p> <p>6: "However, we only Lifestyle impacted MS only indirectly (β: -0.302; 95%CI: -0.369 to -0.254) though health consciousness." This sentence was not clear.</p> <p>7: "Every participant was volunteered, provided verbal consent prior to data collection, and could refuse to participate anytime. " Adolescents aged less than 18 years old only provide verbal consent?"</p>
-------------------------	---

REVIEWER	wei wang School of medical and health sciences, Edith Cowen University, Australia
REVIEW RETURNED	23-Jun-2020

GENERAL COMMENTS	<p>General comments: The paper addressed a very important topic "suboptimal health" from the perspectives of predictive, preventive and precision health/medicine, but unfortunately it has not been well written (very prescriptive, less logic, poorly design, need statistical technical support, many contradictory in the statements. It can be only publishable pending on intensive revision (see my specific comments).</p> <p>Specific comments;</p> <ol style="list-style-type: none"> 1. The internationally recognized term "suboptimal health" should be used in the Title and also throughout the manuscript. "Sub-health" has only been recognised within China. 2. This is not a national representative study based on the sample size and also the geographical areas where the participants recruited. In addition, only urban participants were recruited. 3. The inclusion and exclusion criteria should be clearly given. 4. The progress on the topic Suboptimal studies in Chinese and also other ethnic groups such as African and Caucasian should be acknowledged. 5. Objective measures studies on Suboptimal Health, e.g., microbiome, telomere length, hormone, metabolites and glyccan, should be updated in the Background and discussed in the Discussion. 6. Discuss the comparison between "sub-health measurement scale (SHMS) V1-0" and the internationally recognised Suboptimal Health Questionnaire-25. 7. The cut-off value for Suboptimal Health diagnosis? 8. Participants were recruited from two geographical areas, but how many samples sizes has not been given clearly,. 9. Define "health consciousness" clearly in the Introduction 10. Define "mediating effect" clearly ? Via what to mediate:? 11. Methods: No details was given in the Method section for Models 1, 2 3 12. Contradictory statements on Life Style vs mediating effect on Suboptimal Health in the conclusion. 13. Many typos and grammatical mistakes. Need English editing.
-------------------------	---

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name
Tao Xu

Institution and Country
School of Basic Medicine, Peking Union Medical College, China

Please state any competing interests or state 'None declared':
None declared.

Response: Thank you for your valuable suggestion. We have addressed this issue accordingly, and included the statement "None declared" in the Competing interest section of our manuscript.

Please leave your comments for the authors below

1 : '3969 residents age 14 and older' participated in this research. Why did both adolescents and adults researched in one article? Adolescents and adults have different physical and psychological conditions. Authors should study adolescents and adults respectively?

Response: Thank you for your valuable suggestion. We considered participants in five provinces and only analyzed urban residents aged 18 years and older. All the results were re-analyzed.

2: The four-stage stratified sampling method should clarify more clearly.

Response: Thank you for your valuable suggestion. We added the specified method of our four-stage stratified sampling method in the Study design and population subsection of our Methods, as follows: In the first stage, we chose one province each from five administrative divisions in China; we selected Guangdong province, Heilongjiang province, Sichuan province, Gansu province, and Tianjin city. Second, we chose three to four cities from each province by considering their level of economic development and regional distribution. Subsequently, we randomly selected two to four streets in the selected urban areas. Lastly, we investigated the urban residents who conveniently qualified from each street.

3: Only 3535 urban residents were analyzed in three provinces. No rural residents were selected. Is it representative for Chinese population?

Response: Thank you for your comment. Before we submitted this article, we only investigated three regions. However, our present study involved five regions that included 5,803 Chinese urban residents. The results in this study are updated. Moreover, we only investigated Chinese urban residents; we have adjusted the Title and Abstract accordingly.

4: Sample size calculation method in this article was to estimate the prevalence of SHS, was not appropriate for the main purpose of this study.

Response: Thank you for your valuable comment. We calculated the sample size using the sample size calculation formula of the cross-sectional study design, which might not be suitable to this article since it mainly focused on the SEM model. However, after understanding the sample size requirement of the SEM model (i.e., no accurate sample size formula and usually estimated using 10 times the number of variables), we found the sample size to be adequate. Thus, we deleted the sample size calculation in our paper.

5: In multi-stage sampling, survey data have a hierarchical structure in which individuals were nested within higher level sampling units. Individual SHS was determined by not merely individual characteristics as well as features of the social environments in which individuals live. The authors should use more appropriate analysis method to control the cluster effect of living circumstances.

Response: Thank you for your valuable suggestion. We have tested the cluster effect per region, but we found no statistically significant ICC. We have listed the results of the ICC testing in the Results, as follows:

Because we used the multi-stage sampling method in this study, there might be a cluster effect nested within sampling regions. We examined ICC and its significance using a two-level linear multilevel model. For physical, mental, and social SHS, there was no cluster effect in the regions, while the ICC was 0.028, 0.01, and 0.035, with P-values of 0.085, 0.103, and 0.084, respectively. Thus, traditional SEM models could be used in the analysis of the association of lifestyle, health consciousness, and SHS.

6: "However, we only Lifestyle impacted MS only indirectly (β : -0.302; 95%CI: -0.369 to -0.254) though health consciousness." This sentence was not clear.

Response: Thank you for your valuable suggestion. We have revised this syntax error accordingly.

7: "Every participant was volunteered, provided verbal consent prior to data collection, and could refuse to participate anytime. "Adolescents aged less than 18 years old only provide verbal consent?"

Response: Thank you for your valuable suggestion. Addressing this in relation to your previous suggestions, our study now includes only adults aged 18 years and over, after increasing the sample size by adding more survey areas.

Reviewer: 2
Reviewer Name
wei wang

Institution and Country
School of medical and health sciences,
Edith Cowen University,
Australia

Please state any competing interests or state 'None declared':
None declared'

Response: Thank you for your valuable suggestion. We have addressed this issue accordingly, and included the statement "None declared" in the Competing interests section of our manuscript.

Please leave your comments for the authors below

General comments: The paper addressed a very important topic "suboptimal health" from the perspectives of predictive, preventive and precision health/medicine, but unfortunately it has not been well written (very prescriptive, less logic, poorly design, need statistical technical support, many contradictory in the statements. It can be only publishable pending on intensive revision (see my specific comments).

Specific comments;

1. The internationally recognized term "suboptimal health" should be used in the Title and also throughout the manuscript. "Sub-health" has only been recognised within China.

Response: Thank you for your valuable suggestion. All use of the term "sub-health" in our manuscript have been replaced with "suboptimal health."

2. This is not a national representative study based on the sample size and also the geographical areas where the participants recruited. In addition, only urban participants were recruited.

Response: Thank you for your valuable comment. We only studied urban residents, without clearly articulating it before. Now, we have clearly illustrated this fact in the Title, Abstract, and main text of our manuscript.

3. The inclusion and exclusion criteria should be clearly given.

Response: Thank you for your valuable suggestion. The inclusion and exclusion criteria were added in the second paragraph of "Study design and population", as follows.

This study included individuals aged 18 years and older, who lived in an urban area for more than six months, and volunteered in our investigation. We excluded individuals who had a confirmed disease in the last two months, were unable to complete the questionnaire due to visual or hearing impairment, and with missing values in lifestyle, health consciousness, and SHS items.

4. The progress on the topic Suboptimal studies in Chinese and also other ethnic groups such as African and Caucasian should be acknowledged.

Response: Thank you for your valuable suggestion. In the discussion part, we acknowledged the other studies working on SHS, as follows.

This result is in accordance with other studies involving young and middle-aged intellectuals in Guangzhou,⁴⁰ Chinese migrant workers,⁴¹ and those that use other SHS evaluation questionnaires in China, such as the SHSQ-25.6⁹ Similarly, African¹⁴ and Caucasian⁴² studies showed the same SHS rate.

5. Objective measures studies on Suboptimal Health, e.g., microbiome, telomere length, hormone, metabolites and glyccan, should be updated in the Background and discussed in the Discussion.

Response: Thank you for your valuable suggestion. We mentioned the objective measures studies on Suboptimal Health in the Background, as follows.

It is reported that SHS can be measured objectively using microbiome,¹⁰ telomere length,¹¹ plasma stress hormones,¹² plasma metabolites,¹³ and glycan.¹⁴ However, these objective measures are not easily accessible, and sometimes may not be obvious, especially when people have uncomfortable feelings without abnormal symptoms. A self-rated method that uses a questionnaire is widely applicable in assessing SHS. In China, the sub-health measurement scale (SHMS V1.0), suboptimal health status questionnaire (SHSQ-25)¹⁵ and Chinese sub-health scale (CSHES)¹⁶ were widely used for assessing SHS. However, compared to the other questionnaires, SHMS V1.0 assesses of the physical, mental, and social aspects of SHS, which is in accordance with the health concept proposed by WHO in 1947.

However, we mainly discussed the self-rated SHS and its relationships with consciousness and lifestyle; thus, we did not include the objective measures in the Discussion section of our manuscript.

6. Discuss the comparison between "sub-health measurement scale (SHMS) V1-0" and the internationally recognised Suboptimal Health Questionnaire-25.

Response: Thank you for your valuable suggestion. The SHSQ-25 is a very useful questionnaire to assess SHS. We cited studies that used SHSQ-25 and discussed the suggested differences in the Introduction section, as follows:

In China, the sub-health measurement scale (SHMS V1.0), suboptimal health status questionnaire (SHSQ-25)¹⁵ and Chinese sub-health scale (CSHES)¹⁶ were widely used for assessing SHS. However, compared to the other questionnaires, SHMS V1.0 assesses of the physical, mental, and social aspects of SHS, which is in accordance with the health concept proposed by WHO in 1947.

We also cited related studies in the Discussion section, as follows:

This result is in accordance with other studies involving young and middle-aged intellectuals in Guangzhou,⁴⁰ Chinese migrant workers,⁴¹ and those that use other SHS evaluation questionnaires in China, such as the SHSQ-25.^{6 9} Similarly, African¹⁴ and Caucasian⁴² studies showed the same SHS rate.

7. The cut-off value for Suboptimal Health diagnosis?

Response: Thank you for your valuable suggestion. We added the cut-off value for Suboptimal Health diagnosis in the paragraph of "SHS assessment", as follows:

The cut-off value for suboptimal health diagnosis referred to norms of SHMS V1.0 for Chinese urban residents were established by our research group. 38

8. Participants were recruited from two geographical areas, but how many samples sizes has not been given clearly.

Response: Thank you for your valuable suggestion. We have increased the sample size of our study by including two other regions, which we have investigated recently. We have also described the samples sizes of each region in the Study design and population subsection of our Methods section, as follows:

Among them, 1,704, 1,328, 954, 925, and 892 participants were from Guangdong, Heilongjiang, Sichuan, Gansu and Tianjin provinces, respectively.

9. Define "health consciousness" clearly in the Introduction

Response: Thank you for your valuable suggestion. We have provided a clear definition of health consciousness in the Introduction section of our manuscript, as follows:

Health consciousness is a psychological construct that corresponds to the awareness about one's health, and the willingness to change one's behaviors in order to improve it.^{34 35} Moreover, it is related to anxiety, stress, depression, and non-treatable diseases.³⁶

10. Define "mediating effect" clearly ? Via what to mediate:?

Response: Thank you for your valuable suggestion. This study mainly investigated the mediating effect of health consciousness on the association of lifestyle with physical, mental, and social SHS. Thus, health consciousness is the mediating variable. We added a sentence in the Statistical analysis section, as follow.

Mediating effect of health consciousness was the same with indirect association of lifestyle and SHS via health consciousness. Ratio of mediating effect to direct effect and proportion of mediating effect to total effect were both calculated.

We also modified the results and conclusions like this:

In the last part of the results: Ratio of mediating effect of health consciousness to direct effect of lifestyle with physical, mental, and social SHS was 1.28, 1.53, and 1.66, respectively. Proportion of mediating effect of health consciousness to total effect of lifestyle with physical, mental, and social SHS was 56.23%, 60.54%, and 62.61%, respectively.

In the conclusions: In this large representative cross-sectional study of Chinese urban residents, we found that direct association of lifestyle with physical, mental and social SHS were smaller than direct association and mediating effect of health consciousness.

11. Methods: No details was given in the Method section for Models 1, 2 3

Response: Thank you for your valuable suggestion. Models 1, 2, and 3 have been described in "Statistical analysis", as follows.

We used structural equation modeling (SEM) to analyze the complexity of associations between lifestyle, health consciousness, and SHS (Model 1: SEM model of lifestyle, health consciousness, and PS; Model 2: SEM model of lifestyle, health consciousness, and MS; Model 3: SEM model of lifestyle, health consciousness, and SS).

12. Contradictory statements on Life Style vs mediating effect on Suboptimal Health in the conclusion.

Response: Thank you for your valuable suggestion. We modified the conclusion, as follow:

In this large representative cross-sectional study of Chinese urban residents, we found that direct association of lifestyle with physical, mental, and social SHS were smaller than direct association and mediating effect of health consciousness. Moreover, health consciousness was more important in preventing physical, mental, and social SHS than lifestyle, and might be useful in changing unhealthy lifestyle and reducing the influence of poor lifestyle on physical, mental, and social SHS.

13. Many typos and grammatical mistakes. Need English editing.

Response: Thank you for your valuable suggestion. We have consulted a professional English editing service to help us with the typographical and grammatical overlaps in our paper.

VERSION 2 – REVIEW

REVIEWER	Tao Xu School of Basic Medicine, Peking Union Medical College ,China
REVIEW RETURNED	18-Aug-2020

GENERAL COMMENTS	Authours have made revisions in detail.
-------------------------	---

REVIEWER	wei wang School of Medical and Health Sciences, Edith Cowan University. Australia
REVIEW RETURNED	14-Aug-2020

GENERAL COMMENTS	<p>Authors have addressed the main points I raised accordingly. It is publishable pending on minor revisions:</p> <ol style="list-style-type: none"> 1. The "national" should be removed from the "first national representative analysis " as I mentioned in my 1st-round review the samples size is too small to represent a nation with 1.4 billion people with at least 40% of them resident in urban China. 2. "Suboptimal health diagnosis" should be replaced by "Suboptimal health assessment" because " Suboptimal health" is not a disease. 3. The first SHS study in urban Chinese population should be acknowledgment in the Introduction and discussed in the Discussion. (Yan et al 2012, J Urban Health) 4. The first SHS study in Caucasian population should be updated in the Introduction and referenced in the Discussion. (Kupaev V., et al. EPMA J 7: 19-25) 5. SHS concept is mainly based on Transitional Chinese Medicine (TCM) and prevention is the key. The roles of SHS in TCM and preventive medicine should be pointed in the Introduction and Discussion to attract more readers. (see Wang et al EPMA J 5: 4-12; Wang and Yan, 2012.. Clin Transl Med 1: 28-33) 6. Typos in the Ref section need to be corrected.
-------------------------	--

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name
Tao Xu

Institution and Country
school of Basic Medicine, Peking Union Medical College ,China

Please state any competing interests or state 'None declared':
NONE

Please leave your comments for the authors below
Authours have made revisions in detail.
Response: Thank you very much for your approval.

Reviewer: 2
Reviewer Name
wei wang

Institution and Country
School of Medical and Health Sciences,
Edith Cowan University.
Australia

Please state any competing interests or state 'None declared':
NA

Please leave your comments for the authors below
Authors have addressed the main points I raised accordingly. It is publishable pending on minor

revisions:

1. The "national" should be removed from the "first national representative analysis " as I mentioned in my 1st-round review the samples size is too small to represent a nation with 1.4 billion people with at least 40% of them resident in urban China.

Response: Thank you for your valuable suggestion. We have removed the "national" from the description of "first national representative analysis ".

2. "Suboptimal health diagnosis" should be replaced by "Suboptimal health assessment" because " Suboptimal health" is not a disease.

Response: Thank you for your valuable suggestion. We have replaced the "Suboptimal health diagnosis" with the description of "Suboptimal health assessment".

3. The first SHS study in urban Chinese population should be acknowledgment in the Introduction and discussed in the Discussion. (Yan et al 2012, J Urban Health)

Response: Thank you for your valuable suggestion. We acknowledged the first SHS study on urban Chinese population (Yan et al 2012, J Urban Health) in the "introduction" section. As follows, The first SHS study on urban Chinese population⁹ pointed that SHS was associated with risk factors of chronic diseases and contributed to the development of them.

4. The first SHS study in Caucasian population should be updated in the Introduction and referenced in the Discussion. (Kupaev V., et al. EPMA J 7: 19-25)

Response: Thank you for your valuable suggestion. We acknowledged this study in the introduction and reference section.

5. SHS concept is mainly based on Transitional Chinese Medicine (TCM) and prevention is the key. The roles of SHS in TCM and preventive medicine should be pointed in the Introduction and Discussion to attract more readers. (see Wang et al EPMA J 5: 4-12; Wang and Yan, 2012.. Clin Transl Med 1: 28-33)

Response: Thank you for your valuable suggestion. We acknowledged this two studies in the introduction and reference section, as follows:

SHS concept is mainly based on Transitional Chinese Medicine (TCM) and prevention is important²⁶
27.

6. Typos in the Ref section need to be corrected.

Response: Thank you for your valuable suggestion. We have carefully checked the Ref section and corrected the typos:

We tried our best to improve the manuscript and revise the manuscript, according to the comments. We marked in red in revised paper.

We appreciate for Editors/Reviewers' warm work earnestly, and hope that the correction will meet with approval.

Once again, thank you very much for your comments and suggestions.