

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	The relationship between stress-related psychosocial work factors and suboptimal health among Chinese medical staff: a cross-sectional study
AUTHORS	Liang, Yingzhi; Chu, Xi; Meng, Shijiao; Zhang, Jie; Wu, Lijuan; Yan, Yuxiang

VERSION 1 – REVIEW

REVIEWER	Marko Elovainio University of Helsinki Finland
REVIEW RETURNED	25-Jul-2017

GENERAL COMMENTS	<p>The paper is clear and well written and although it has some strengths (relatively large sample, elegant statistics) I don't think that the contribution is quite strong enough (testing a structural validity of a known instrument in a non-representative sample using a cross-sectional design) for BMJ. My suggestions for improving the manuscript are, however, as follows:</p> <ol style="list-style-type: none">1. Please provide more information about the content of the dimensions included in the Copenhagen Psychosocial Questionnaire (CPQ). Now only the titles of the dimensions are presented.2. There is a huge body of research about the work related psychosocial factors and multiple dimensions/ measures have been widely used. Please provide (stronger) justification for choosing CPQ and the dimensions included to be tested in your study.3. Please justify why not include the rest of the dimensions of the CPQ and use them as outcomes.4. Please justify for not testing the association between CPQ dimensions and suboptimal health separately in men and women? At least report whether the gender interaction was significant.5. The fit indexes are not quite as good as could be expected. Please provide reference for your interpretation about the model fit.6. Because you are not providing any reference for the cut-off point for the sub-optimal health why not using it as continuous measure as it is? You could get rid of all the sensitivity analyses with different cut-off points?
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REVIEWER	Amy Zadow Asia Pacific Centre for Work Health and Safety, University of South Australia, Australia.
REVIEW RETURNED	22-Aug-2017

<p>GENERAL COMMENTS</p>	<p>The authors of this paper have addressed a very important issue using a relatively large cross sectional sample. It is clear that considerable, careful work has been done to understand the role of psychosocial risk factors and suboptimal health. However there are a number of points that need more attention:</p> <ol style="list-style-type: none"> 1) The COPSOQ items you have selected do not measure psychosocial work stress. They measure psychosocial risk factors such as job demands and job insecurity. It would be important to remove the references to psychosocial work stress in the abstract and text as this could cause confusion. 2) There is already a great deal of research linking psychosocial risk factors to health including meta-analyses and longitudinal papers. It is important to explain what the gap in research knowledge is that the pre-existing research does not address and how this paper addresses that gap. 3) In the introduction there needs to be a clear explanation about why psychosocial risk factors influence health based on a theoretical framework. 4) Justification for why job satisfaction was measured needs to be provided. Unlike the other COPSOQ items this is not a psychosocial characteristic of the work environment and is instead an outcome of exposure to psychosocial risks. 5) Revision of some of the sentences would make the message clearer (e.g. page 8, lines 1-3; page 12, lines 29-39). 6) It would be better to put the description of the figure information with the figure (e.g. page 8, 44-56). 7) More information about what the numbers represent is needed in the tables (e.g. Table 1, Table 3, Table S2). 8) The figures appear to be a direct print out from the statistics program. For clarity it might be better to develop your own figures so that you can remove the error loadings and include the relevant regression coefficients seen in Table S4 and S5 (enabling you to remove these tables). <p>How workplace psychosocial risks relate to health amongst medical staff is an important topic. The authors have clearly done extensive careful work and I commend them on their efforts and hope that they continue with their research in this area.</p>
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VERSION 1 – AUTHOR RESPONSE

The specific responses to reviewer 1's comments:

Comment # 1 Please provide more information about the content of the dimensions included in the Copenhagen Psychosocial Questionnaire (CPQ). Now only the titles of the dimensions are presented.

Response: Just as the reviewer's comment, the COPSOQ questions used in psychosocial work factors survey was shown in online supplementary table S1 (see Supplementary files 1, Table S1).

Comment # 2 There is a huge body of research about the work related psychosocial factors and multiple dimensions/ measures have been widely used. Please provide (stronger) justification for choosing CPQ and the dimensions included to be tested in your study.

Response: This study focused on survey psychosocial factors at work which can reflect psychosocial work stress among Chinese medical staff. The psychosocial work factors that were found to be important contributors to occupational stress in healthcare settings are heavy workload, low job control, low co-worker support, low supervisor support, high effort-reward imbalance and low job satisfaction in different studies [1-2].

Compared to other questionnaires, such as the Job Content, Job Stress Scale and various questionnaire developed by the authors, the content of Copenhagen Psychosocial Questionnaire (COPSOQ) [3] cover : (i) different levels of analysis (organization, department, job, person–work interface, and individual), (ii) worktasks, the organization of work, interpersonal relations at work, cooperation, and leadership, (iii) potential work stressors, as well as resources such as support, feedback and commitment. Moreover, the questionnaire is generic, meaning that it is applicable in all sectors of the labor market (not only industry, but also the service sector, human service work, and communication). Finally, the Chinese version of the questionnaire was translated by professionals in psychology at the university of Tianjin business had been shown good reliability and validity with Cronbach’s alpha coefficients of 0.7 in the population with different professions [4-5]. (see page 6, line 2).

In conclusion, the COPSOQ can evaluate the psychosocial factors at work more comprehensively and help us solve research problems in current study. This instrument includes three versions: a long version for research use, a medium-length version to be used by work environment professionals, and a short version for workplaces. Our study was based on the short Chinese version of COPSOQ, which consists of 44 questions forming 8 scales. We selected 34 questions including 5 psychosocial work characteristics related dimensions from a short version of COPSOQ with namely ‘Demands at work’, ‘Influence and development’, ‘Interpersonal relations and leadership’, ‘Insecurity at work’ and ‘Job satisfaction’ to assess stress-related psychosocial work factors (see page 6, line 4-7).

Comment # 3 Please justify why not include the rest of the dimensions of the CPQ and use them as outcomes.

Response: The other research question concerned by current survey was the suboptimal health status of medical staff. The remaining three health-related dimensions, including ‘general health’, ‘mental health’ and ‘vitality’, in the original short version of COPSOQ were considered to be too simple and inadequate to assess the Suboptimal Health Status well. While, the SHSQ-25 which accounts for the multidimensionality of SHS by encompassing the domains of fatigue, the cardiovascular system, the digestive tract, the immune system, and mental status was more useful for us to measure sub-health status and further prevented diseases. Our previous research has shown the SHSQ-25 was a reliable and valid instrument for measuring sub-health status in urban Chinese [6]. In order to complete current survey better, the remaining three health-related dimensions in the original short version of COPSOQ were not used in our research.

Comment # 4 Please justify for not testing the association between CPQ dimensions and suboptimal health separately in men and women? At least report whether the gender interaction was significant.

Response: Univariate analyses shown the difference in the score of negative psychosocial work stress factor between men and women was not significant ($P=0.292$). But, women were lower score of positive psychosocial work stress factor than men ($P<0.001$). In other word, women were more likely to suffer from stress-related psychosocial work factors than men. (see page 10, line 17-19). According to logistic regression analysis, female was a risk factor for suboptimal health (Table 1). The gender gap in suboptimal health status in our study may be explained by the discriminatory impact of gender on the susceptible to stress-related psychosocial work factors and the individuals with high level of psychosocial work stress were in high risk of SHS (see page 13, line 6-10). Thanks for the reviewer’s comment again, we have reported the influence of gender interaction on suboptimal health in discussion.

Table 1 The influence factors of suboptimal health (P50) by logistic regression analysis

Variable	β	S \bar{x}	Wald	χ^2	P	OR	95%CI
Gender (female)	0.92	0.26	13.08	<0.001	2.51	1.53-4.14	
Education level							

High school and below - - 10.90 0.012 1.00 -
 Junior college 1.03 0.36 8.10 0.004 2.80 1.34-5.70
 University 0.85 0.29 8.67 0.003 2.34 1.33-4.11
 Graduate students and above 0.42 0.27 2.37 0.124 1.52 0.89-2.58
 occupation
 Others - - 8.80 0.032 1.00 -
 Doctors -0.60 0.25 5.74 0.017 0.55 0.33-0.90
 Medical technicians -0.19 0.32 0.34 0.560 0.83 0.45-1.55
 Nurses 0.03 0.24 0.02 0.901 1.03 0.64-1.65
 negative psychosocial work stress factor 0.45 0.05 71.18 <0.001 1.57 1.42-1.74
 positive psychosocial work stress factor -0.03 0.01 5.82 0.016 0.97 0.95~0.99

Comment # 5 The fit indexes are not quite as good as could be expected. Please provide reference for your interpretation about the model fit.

Response: Model fitting criteria were as follows: A CFI value of greater than 0.90 showed a psychometrically acceptable fit to the data; The value of AGFI ranged between 0 and 1, a value of 1 indicated a perfect fit; For the SRMR, values of 0.08 or lower represented good fit; The value of RMSEA should be below 0.06 to show good fit [7-8]. (see the footnote of Table 2 in manuscript) Table 2 in manuscript showed the original first-order factor model (M1a) and second-order factor model (M2a) were not fit well (CFI<0.9, AGFI>0.70, SRMR>0.08 and RMSEA>0.06). But, the modified first-order factor model (M1b) and second-order factor model (M2b) based on modification index [9] were both meet the criteria as above (CFI>0.09, AGFI>0.86, SRMR<0.08 and RMSEA<0.06). Furthermore, we performed a χ^2 difference test to compared modified second-order factor model (M2b) with modified factor first-order model (M1b).(see page 9, line 13-16)

Comment # 6 Because you are not providing any reference for the cut-off point for the sub-optimal health why not using it as continuous measure as it is? You could get rid of all the sensitivity analyses with different cut-off points?

Response: Just as the reviewer's advice, we performed linear regression using the score of SHSQ-25 as dependent variable. Results were listed in Table 2. Gender, education level, occupation, negative psychosocial work stress and positive psychosocial work stress were the factors that influenced the score of SHSQ-25 (P<0.001). The results were in line with the results of logistic regression analysis. Considering that the odds ratios (ORs) were more helpful to us for predicting and preventing SHS. Thus, we preferred to perform logistic analysis based on the cut-off point for the sub-optimal health in order to obtain ORs of sub-optimal health in current study.

Table 2 Predicting suboptimal health status by linear regression

Variable	Unstandardized Coefficients	Standardized Coefficients	t	P
B 95% CI for B Beta				
Age	-0.84 -2.10-0.41	-0.05	-1.32	0.186
Gender	7.66 4.80-10.52	0.22	5.26	<0.001
Education level	-2.36 -3.42--1.30	-0.15	-4.38	<0.001
Occupation	1.89 0.94-2.85	0.14	3.89	<0.001
Physical exercise	2.02 0.80-3.97	0.06	2.04	0.041
Smocking	1.36 -2.37-5.10	0.03	0.72	0.474
Drinking	-2.28 -5.35-0.80	-0.06	-1.46	0.146
Night shift	-1.37 -3.45-0.71	-0.04	-1.30	0.196
Weekly working hours	1.49 -0.60-3.59	0.05	1.40	0.162
Negative psychosocial work stress factor	3.03 2.44-3.61	0.33	10.17	<0.001
Positive psychosocial work stress factor	-0.25 -0.38--0.11	-0.11	-3.59	<0.001

The specific responses to reviewer 2's comments:

Comment # 1 The COPSOQ items you have selected do not measure psychosocial work stress. They measure psychosocial risk factors such as job demands and job insecurity. It would be important to remove the references to psychosocial work stress in the abstract and text as this could cause confusion.

Response: According to the reviewer's advice, we have conducted the corresponding modification.

Comment # 2 There is already a great deal of research linking psychosocial risk factors to health including meta-analyses and longitudinal papers. It is important to explain what the gap in research knowledge is that the pre-existing research does not address and how this paper addresses that gap.

Response: Firstly, although the aforementioned study has demonstrated the prevalence of SHS and its consequences, few studies that have addressed the issue of psychosocial factors at work and suboptimal health among medical staff in China. This study aimed to evaluate the impact of stress-related psychosocial work factors on suboptimal health status and their associations (see page 5, line 6-8).

Secondly, as a default generic method, the average scores for each dimension of COPSOQ were calculated and compared. But this method ignored the relationship between each item and corresponding dimension. To explore the association among each dimension of COPSOQ, we conducted confirmative factor analysis (CFA) which could estimate the relationship between each latent variable (i.e. each dimension of COPSOQ) and between observed variables (i.e. items of dimensions) and corresponding latent variable as well. (see page 6, line 14-17). Previous studies [10] also showed the factor loadings calculated by traditional factor analysis were less accurate and precise than that calculated by structural equation modeling, due to the traditional method could not control the effects of other variables and caused message loss when extracting common factors. By contrast, structural equation modeling could get factor loadings both of indicators to first-order factors and first-order factors to second-order factors. The standardized regression coefficients, also called standardized factor loadings, estimated the relational degree between indicators and first-order factors, first-order factors and second-order factors under controlling other variables. The other difference with traditional method is that structural equation modeling allows measurement error of indicators. (see page 12, line 12-17)

Comment # 3 In the introduction there needs to be a clear explanation about why psychosocial risk factors influence health based on a theoretical framework.

Response: According to the reviewer's advice, we have supplemented a clear explanation about why psychosocial risk factors influence health based on a theoretical framework in the introduction. (see page 4, line 5-10)

Comment # 4 Justification for why job satisfaction was measured needs to be provided. Unlike the other COPSOQ items this is not a psychosocial characteristic of the work environment and is instead an outcome of exposure to psychosocial risks.

Response: We acknowledged the reviewer's point, but we measured job satisfaction among Chinese medical staff for the following reasons. Job satisfaction is considered as an overall emotional state resulting from the appraisal of one's job, or as a related set of attitudes about various aspects of the work environment. It is a critical issue for healthcare services and has been demonstrated as having important implications for the individual's health (burnout, stress, depression) and for his/her work attitude (intention to leave, turnover, absenteeism).

Moreover, the psychosocial work factors that were found to be important contributors to occupational stress in healthcare settings are heavy workload, low job control, low co-worker support, low supervisor support, high effort-reward imbalance, complaints from patients and relatives, and low job satisfaction in different studies [1-2] (see page 12, line 6).

Comment # 5 Revision of some of the sentences would make the message clearer (e.g. page 8, lines 1-3; page 12, lines 29-39).

Response: According to the reviewer's advice, we have revised and polished the sentences of the article. (see page 8, line 11-14, page 9, line 17-21 and page 12, line 21-24)

Comment # 6 It would be better to put the description of the figure information with the figure (e.g. page 8, 44-56).

Response: According to the reviewer's advice, we have put the description of the figure information with the figure. (see footnote of Figure 1 and online supplementary file 2)

Comment # 7 More information about what the numbers represent is needed in the tables (e.g. Table 1, Table 3, Table S2).

Response: According to the reviewer's advice, we have put more information about the tables. (see page 8, line 5-14; page 10, line 15-20)

Comment # 8 The figures appear to be a direct print out from the statistics program. For clarity it might be better to develop your own figures so that you can remove the error loadings and include the relevant regression coefficients seen in Table S4 and S5 (enabling you to remove these tables).

Response: According to the reviewer's advice, we have retained the figures which were modified more visual and removed Table S4 and S5. (see online supplementary files)

[1] Fiabane E, Giorgi I, Musian D, Sguazzin C, Argentero P. Occupational stress and job satisfaction of healthcare staff in rehabilitation units. *Med Lav.* 2012; 103 (6): 482-92.

[2] Weinberg A, Creed F. Stress and psychiatric disorder in healthcare professionals and hospital staff. *Lancet.* 2000; 355 (9203): 533-7.

[3] Kristensen TS, Hannerz H, Høgh A, Borg V. The Copenhagen Psychosocial Questionnaire - a tool for the assessment and improvement of the psychosocial work environment[J]. *Scand J Work Environ Health,* 2005, 31(6):438-449.

[4] Shang L, Liu P, Fan LB, et al. Psychometric Properties of the Chinese Version of Copenhagen Psychosocial Questionnaire [article in China]. *J Environ Occup Med* 2008; 25: 572-576.

[5] Meng SJ, Yan YX, Liu YQ, et al. Reliability and validity of Copenhagen Psychosocial Questionnaire of Chinese [article in China]. *Chin Prev Med* 2013; 14:12-15.

[6] Yan YX, Liu YQ, Li M, Hu PF, Guo AM, Yang XH, Qiu JJ, et al. (2009). Development and evaluation of a questionnaire for measuring suboptimal health status in urban Chinese. *J Epidemiol* 19(6): 333-41.

[7] Kline RB. Measurement models and confirmatory factor analysis. In *Principles and practice of structural equation modeling*, 3rd Ed. The Guilford Press: New York, London, 2005; pp. 230-51.

[8] Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling* 1999; 6: 1-55.

[9] Barbara MB. *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming*, 2nd Ed. Taylor & Francis Group: New York, London, 2001; pp. 108-11.

[10] Babyak M, Green S. Confirmatory factor analysis: An introduction for psychometric medicine researchers. *Psychosomatic Medicine* 2010; 72: 587-597.

VERSION 2 – REVIEW

REVIEWER	Stephen Stansfeld Queen Mary University of London
REVIEW RETURNED	12-Dec-2017

GENERAL COMMENTS	The authors have addressed the comments of the referees.
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REVIEWER	Xiaoshan Zhao Sounthern Medical University, China
REVIEW RETURNED	04-Jan-2018

GENERAL COMMENTS	<p>This manuscript explored the associations between stress-related psychosocial work factors and suboptimal health status (SHS), and develops and validates a model to measure psychosocial work factors among Chinese medical staff based on confirmatory factor analysis. The authors concluded that the modified second-order factor model was a suitable method; and the negative and positive psychosocial work stress factors might be the risk and protective factor of suboptimal health, respectively.</p> <p>The manuscript can be publishable pending on revision. Specific comments:</p> <ol style="list-style-type: none"> 1. The paper would benefit from a brief explanation of the health measures. There are two categories of health measures: subjective measure (Questionnaire: e.g. SF-36, SHMS V 1.0, SHSQ25,) vs. objective measure (Anthological-physiological and biochemical measures, e.g., BP, BMI, CRP, LDL...). 2. The assessment of SHS was used by the Suboptimal Health Status Questionnaires-25 (SHSQ-25); and to my knowledge, there have been some other instruments for measuring sub-health, like the Sub-health measurement scale version 1.0 (SHMS V 1.0) (See: 1. Bi, J. et al., Association of lifestyle factors and suboptimal health status: a cross-sectional study of Chinese students. <i>BMJ OPEN</i> 4 e5156 (2014). 2. Chen, J. et al., Associations between breakfast eating habits and health-promoting lifestyle, suboptimal health status in Southern China: a population based, cross sectional study. <i>J TRANSL MED</i> 12 348 DIO: 10.1186/s12967-014-0348-1 (2014).), and Suboptimal Health Questionnaire 25 (SHSQ-25) (See: Yan et al (2009) Development and evaluation of a questionnaire for measuring suboptimal health status in urban Chinese. <i>Journal of Epidemiology</i>. doi:10.2188/jea.JE20080086), which have been recognized instrument for measuring SHS. The comparison of the two SHS questionnaires (SHSQ-25 and SHMS V1.0) would strengthen both the academic merits and the quality of the manuscript. 3. As for the definition and diagnosis of SHS, participants diagnosed with clinical disease should be excluded. What are the diagnosis criteria for the disease group when the participants were classified: participant self-report or diagnosed by clinical doctors? 4. The methods described are not very clear, the authors how to eliminate the interference factors, such as the individual character, the family genetics and financial environment, different subjects, which may affect the final conclusions; and why did you include students from medical staff aged over 40 years? Are they representative for the overall staff population?
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VERSION 2 – AUTHOR RESPONSE

The specific responses to reviewer 4's comments:

Comment # 1 The paper would benefit from a brief explanation of the health measures. There are two categories of health measures: subjective measure (Questionnaire: e.g. SF-36, SHMS V 1.0, SHSQ25,) vs. objective measure (Anthological-physiological and biochemical measures, e.g., BP, BMI, CRP, LDL...).

Response: Prior to survey, the medical staff had attended an annual health medical examination in our study. The health examination included medical history, physical examination, blood biochemical examination, routine urinalysis, rest ECG, chest radiography and so on. The diagnosis was made by associate chief physician or more professional clinical doctors based on medical history and physical examination results. Then, participants who were diagnosed with clinical diseases were excluded. The other participants were classified as 'SHS' and 'non-SHS' groups by different cut-off scores described in our manuscript. Thanks for reviewer's advice. We have supplemented a clear explanation about the health measures in the methods section of manuscript. (see page 6, line 20-22; page 7, line 6-10).

Comment # 2 The assessment of SHS was used by the Suboptimal Health Status Questionnaires-25 (SHSQ-25); and to my knowledge, there have been some other instruments for measuring sub-health, like the Sub-health measurement scale version 1.0 (SHMS V 1.0) (See: 1. Bi, J. et al., Association of lifestyle factors and suboptimal health status: a cross-sectional study of Chinese students. *BMJ OPEN* 4 e5156 (2014). 2. Chen, J. et al., Associations between breakfast eating habits and health-promoting lifestyle, suboptimal health status in Southern China: a population based, cross sectional study. *J TRANSL MED* 12 348 DIO: 10.1186/s12967-014-0348-1 (2014).), and Suboptimal Health Questionnaire 25 (SHSQ-25) (See: Yan et al (2009) Development and evaluation of a questionnaire for measuring suboptimal health status in urban Chinese. *Journal of Epidemiology*. doi:10.2188/jea.JE20080086), which have been recognized instrument for measuring SHS. The comparison of the two SHS questionnaires (SHSQ-25 and SHMS V1.0) would strengthen both the academic merits and the quality of the manuscript.

Response: As the reviewer said, a number of SHS questionnaires have been established and evaluated in China, such as Sub-Health Measurement Scale V1.0 (SHMS V1.0), Multidimensional Subhealth Questionnaire of Adolescents (MSQA), Suboptimal Health Status Questionnaire (SHSQ)-25 and various questionnaires developed by the authors. SHMS V1.0, a 39-items questionnaire, includes physiological (15 items), psychological (13 items) and social (10 items) dimensions. MSQA is aimed at adolescents. SHSQ-25 is a multidimensional questionnaire which covered 5 subscales with 25 items: fatigue (9 items), cardiovascular system (3 items), digestive tract (3 items), immune system (3 items), and mental status (7 items). Previous researches have showed both SHMS V1.0 [1] and SHSQ-25 [2] has good internal consistency in population of medical staff.

However, this study focused on surveying stress-related psychosocial work factors which can reflect suboptimal health status among medical staff. Compared to other questionnaires, the content of SHSQ-25 encompassed multiple systems symptoms that were affected by chronic stress. Therefore, it's more persuasive in explicating the links between stress and SHS, and further helps us to prevent diseases. Moreover, the SHSQ-25 has been shown to be reliable and valid in a large sample health status survey in Beijing [2]. On the other hand, the content and function of social symptoms dimension of SHMS V1.0 were partly repeated with the Copenhagen Psychosocial Questionnaire (COPSOQ) which was used to assess the social-psychological factors at work in our study. Such as question-30, 33, 34, 35, 36, 37 of SHMS V1.0 can be simply summarized by 'Interpersonal relations and leadership' dimension of COPSOQ. And the latter is more comprehensive to assess social and occupational characteristics among medical staff.

In comparison, SHSQ-25 is shorter and easier to complete. In order to complete current survey better, we finally applied SHSQ-25. Just as reviewer's advice, we have supplemented this comparison in the discussion section of manuscript. (see page 12, line 1-7).

Comment # 3 As for the definition and diagnosis of SHS, participants diagnosed with clinical disease should be excluded. What are the diagnosis criteria for the disease group when the participants were classified: participant self-report or diagnosed by clinical doctors?

Response: Participants diagnosed with clinical diseases have been excluded in current study. Please see the response to Comment #1.

Comment # 4 The methods described are not very clear, the authors how to eliminate the interference factors, such as the individual character, the family genetics and financial environment, different subjects, which may affect the final conclusions; and why did you include students from medical staff aged over 40 years? Are they representative for the overall staff population?

Response: To estimate the relationship between suboptimal health status and psychosocial factors at work, a multivariate logistic regression model with adjusting potential confounders including age, gender, education level, occupation, physical exercise, drinking behavior, and smoking status were performed. (see page 7, line 23-24 and Table 4).

The current analysis included 914 medical staff from Xuanwu Hospital who participated in the 2014 annual health medical examination (including physicians, nurses, medical technicians, management staff, researchers and handyman). All participants of this study were older than 40 years of age.

Previous research [3-4] has showed this age group has a high risk of SHS because of the high pressure during the inservice. (see page 5, line 14-16; page 13, line 10-12.)

Although the sample was representative of the diversity of medical staff in one geographical area of the China, the data are not nationally representative and ethnic minority groups are particularly under-represented. As reviewer's advice, we have showed this limitation in manuscript. (see page 3, line 15-16).

References:

- [1] Xu J, Feng LY, Luo R, et al. Assessment of the reliability and validity of the Sub-health Measurement Scale Version1.0 [Article in Chinese]. *Nan Fang Yi Ke Da Xue Xue Bao*. 2011; 31(1):33-8. PMID: 21269952
- [2] Yan YX, Liu YQ, Li M, et al. Development and evaluation of a questionnaire for measuring suboptimal health status in urban Chinese. *J Epidemiol* 2009; 19: 333–341. doi: 10.2188/jea.JE20080086
- [3] Yan YX, Do J, Liu YQ, et al. Association of suboptimal health status and cardiovascular risk factors in urban Chinese workers. *J Urban Health*. 2012, 89: 329–338. doi: 10.1007/s11524-011-9636-8.
- [4] Dong J, Lu JP, Yan YX, et al. Status of sub-health and its influencing factors in some professional populations in Beijing [Article in Chinese]. *Chinese General Practice*. 2011; 14(28):3275-3278.