

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Positive and negative social support and depressive symptoms according to economic status among adults in Korea: Cross-sectional results from the Health Examinees-Gem Study
<b>AUTHORS</b>	Lee, Hwa-Young; Oh, Juhwan; Kawachi, Ichiro; Heo, Jongho; Kim, Sujin; Lee, Jong-Koo; Kang, Daehee

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Tae Kyoung Lee University of Miami Miller School of Medicine
<b>REVIEW RETURNED</b>	03-May-2018

<b>GENERAL COMMENTS</b>	<p>This is an interesting study that examines the social supports and depressive symptoms using advanced statistical approach. Below, I address issues/questions that emerged from my read of the paper.</p> <p>Introduction</p> <ul style="list-style-type: none"><li>• Authors described the main impact of income inequality on depressive symptoms. However, this main effect was not hypothesized.</li><li>• Across the introduction, authors emphasized the interaction effects between SES and (negative and positive) social supports. However, in actual analyses, only income-levels were considered, but not education and employment status. I think that authors should clearly mention that the study only consider about interaction effects between the income level and (negative and positive social supports), but not others.</li><li>• Authors argued that negative- and positive social supports are isolated (independent). However, I think that there may be some unobserved conjoint groups between them. For example, some people may have high levels for positive social supports, but not for negative one. Or, some people may have high levels for negative social supports, but not for positive one. Or, some people may have both high or both low levels (even though the last potential group is quite unrealistic). More importantly, income may have differential effects on these conjoint groups, suggesting the three-way interaction effects (Income level x positive social supports x negative social supports) on depressive symptoms.</li></ul> <p>Measures</p>
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	<ul style="list-style-type: none"> <li>• In the measure, social support is questionable. Is there any reason that authors created three categorical variables? Please describe the reasons.</li> <li>• Related to this measure, did you check the correlation between negative and positive social supports? Please reported the coefficients. That will be helpful for readers to clearly understand how these two measures were separated. Given that authors used categorical variables for these, please check the chi-square value and report effect sizes (e.g., phi). Also, please add supplementary table 2.</li> </ul> <p>Statistical plan</p> <ul style="list-style-type: none"> <li>• Given that the results show that both social supports and income were treated as categorical variables (tables 1 and 2), I wonder how the interaction terms between social support and income were created. Please describe it in the statistical plan for clearly understanding.</li> </ul> <p>Results</p> <ul style="list-style-type: none"> <li>• Please report R-squares for each model in tables 2 and 3.</li> <li>• Nested data structure is the one of assumption to use multilevel model approach. Please report design effects of community level.</li> <li>• In figures 2 and 3, report sample sizes for low- and high-income groups.</li> <li>• Report effect sizes for all significant results. This will allow readers to clearly understand the magnitudes of significant findings.</li> </ul> <p>Discussion</p> <ul style="list-style-type: none"> <li>• Across discussion section, authors used the term “depression disorder”. I wonder whether or not authors consider clinical levels of depressive symptoms. If not, depressive symptoms are more appropriate.</li> </ul> <p>Minors:</p> <ul style="list-style-type: none"> <li>• In abstract, interaction effect is unclear. Is this individual-level interaction or cross-over interaction effect?</li> </ul>
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<b>REVIEWER</b>	Theresa Kim SickKids Research Institute, Canada
<b>REVIEW RETURNED</b>	18-May-2018

<b>GENERAL COMMENTS</b>	<p>Positive and negative social support and depressive symptoms according to economic status among adults in Korea: A multilevel regression analysis</p> <p>The objective of the paper was to determine the associations of social support and depressive symptoms, stratified by positive and negative social support, and examining this association by economic status of Korean adults. The research question is interesting, and an important one, given the rise of suicidal rates in Korea as the authors mention, and how the depressive symptoms are largely related to suicides. Overall, the paper is well-written,</p>
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and the following comments are intended to help the authors improve this manuscript toward eventual publication.

Methods:

- Page 6, line 13: What are the 8 regions in Korea? Consider providing as footnote.
- Page 6, line 15: What is the government-subsidized health examination? i.e., how often are residents visiting the hospital for their health examination or at which time points or age? Please elaborate as many of the readers may not be familiar with this.
- Page 6, Outcome Variable: I wonder if you can provide some reliability and validity numbers here for the outcome variable.
- Page 7, Social Support: Is this a reliable and valid scale (i.e., social experiences checklist)?
- Page 8, Lines 41-42: Can you provide the currency equivalent in dollars as well as provided in the tables as a footnote? It would be helpful to know the low income cut-off or what is deemed as "poor" as you mention throughout the paper. Is being in the <100 Korean Won category considered as "poor"?
- Page 9, Lines 38-54: Does model 3 correspond to the figures 2 and 3 provided in the manuscript? It would be helpful to elaborate.

Results:

- What was the % missing for each of the model? And the overall R-squared? Was the model tested for multi-collinearity? Why were the 8 regions or communities added as part of a covariate?
- Page 10, Line 24: Figure 1 shows that 14 communities were analyzed with 21,208 respondents but in the text here it says 15 communities. Please revise.
- Page 10, Lines 25-33: What was the range of the depressive symptoms scores for these covariates?
- Page 11: I understand that the two can be treated as separate domains of experience but have you examined the correlation between positive social support and negative social support? I would imagine that those who report high level of positive social support would be reporting low negative social support.

Discussion:

- Page 16, Line 5-6: How would the information on suicidal behaviour among adolescents and college students relate to older adults 40-69 years of age (which is your sample)? Are there any literature out there for this particular age group on suicidal behaviour and social support? If not, please state some implications.
- The discussion section talks about suicide rates, and seems to imply that depressive disorders may be a predictor given that only a few of them seek consult or counselling. Is there literature out there to support this? Perhaps, it will be also helpful to include this in the introduction.

	<p>Limitations:</p> <ul style="list-style-type: none"> <li>• Should also account for older data – the data analyzed for this study was 2009-2010 (already 7-8 years old) – has much changed over the last few years?</li> </ul> <p>Tables:</p> <ul style="list-style-type: none"> <li>• Keep decimal places consistent. Some have only 1 decimal place and some have no decimal places.</li> <li>• It would be helpful to have a list of the covariates in each of the models as a footnote.</li> </ul>
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## VERSION 1 – AUTHOR RESPONSE

Response to the reviewers' comments

Authors are grateful to the reviewers for the valuable comment for improving our manuscript.

Reviewer: 1

We authors deeply appreciate the constructive comments. We have summarized the revision as follows.

Introduction

Authors described the main impact of income inequality on depressive symptoms. However, this main effect was not hypothesized.

[Response] Thanks for the comments. Although main impact of income was described in the result as you noticed, that finding was not our main research question because it has been demonstrated in previous studies many times. Therefore, we decided not to include it in our research hypotheses.

Across the introduction, authors emphasized the interaction effects between SES and (negative and positive) social supports. However, in actual analyses, only income-levels were considered, but not education and employment status. I think that authors should clearly mention that the study only consider about interaction effects between the income level and (negative and positive social supports), but not others.

[Response] We agree on the comment. We have now replaced the word 'SES' with 'income level'.

Authors argued that negative- and positive social supports are isolated (independent). However, I think that there may be some unobserved conjoint groups between them. For example, some people may have high levels for positive social supports, but not for negative one. Or, some people may have high levels for negative social supports, but not for positive one. Or, some people may have both high or both low levels (even though the last potential group is quite unrealistic). More importantly, income may have differential effects on these conjoint groups, suggesting the three-way interaction effects (Income level x positive social supports x negative social supports) on depressive symptoms.

[Response] We deeply appreciate your suggesting these possibility. According to the reviewer's suggestion, we have newly tried to run positive and negative social support simultaneously in one model to identify association of each domain of social support with depressive symptom while holding the effect of the other domain of social support constant. We also have tried three-way interaction of income, positive and negative social support on depressive symptom. Each domain of social supports remained their statistical significance with almost same effect size after controlling for each other. All

the three combinations of two-way interactions between income, positive and negative supports were also statistically significant. Three-way interactions, however, were not significant. We have now applied these new results in 'Result' section and subsequent interpretations in the 'Discussion' section of the revised manuscript.

## Measures

In the measure, social support is questionable. Is there any reason that authors created three categorical variables? Please describe the reasons.

[Response] We thought over how best to represent the level of social support. Finally, we decided to refer to De Silva(2007a) and De Silva(2007b) in operating social support variables where structural social capital variables such as social support were coded into absolute levels of social capital(for example, number of individuals or groups respondents received support from) and then categorized. We avoided using social support variable as continuous one because our interest is a general trend of relationship between overall level of social support and depressive symptom rather than focusing on incremental effect of one social support: i.e. effect of having one more people who can give social support on depressive symptom.

Related to this measure, did you check the correlation between negative and positive social supports? Please reported the coefficients. That will be helpful for readers to clearly understand how these two measures were separated. Given that authors used categorical variables for these, please check the chi-square value and report effect sizes (e.g., phi). Also, please add supplementary table 2.

[Response] Thanks to your question, we have now taken your advice to examine strength of relationship between levels of two domains of social support. The result was that there was weak negative correlation between levels of positive and negative social support. These results were added in supplemental table 3. We also have described these briefly in sub-section of 'statistical analyses' of 'Method' section.

Given that the results show that both social supports and income were treated as categorical variables (tables 1 and 2), I wonder how the interaction terms between social support and income were created. Please describe it in the statistical plan for clearly understanding.

[Response] We are sorry for missing the explanation for it. How interaction terms were created is as below. Since level of income, positive and negative social supports were linearly related with depressive symptom in main effect, interaction terms were constructed by multiplying each of variable as a linear variable to avoid having to create too many interaction terms and to simplify the model.

## Results

Please report R-squares for each model in tables 2 and 3.

[Response] Thanks a lot for your suggestion. We have now added R-squares of each model in table 2 (c.f. Table 2 and 3 was merged into a single table during this revision)

Nested data structure is the one of assumption to use multilevel model approach. Please report design effects of community level.

[Response] Thanks for pointing this out. Community level was used as level 2 in the analysis. Now community level variances (and their statistical significances) and Intra-class correlation (ICC) is added now in the table 2.

In figures 2 and 3, report sample sizes for low- and high-income groups.

[Response] Thanks. Sample size of each group is now added into legends of figure 2 and 3.

Report effect sizes for all significant results. This will allow readers to clearly understand the magnitudes of significant findings.

[Response] Thanks a lot for the suggestion. Coefficients and p-values were inserted right next to each relevant texts in parentheses according to your advice.

#### Discussion

Across discussion section, authors used the term “depression disorder”. I wonder whether or not authors consider clinical levels of depressive symptoms. If not, depressive symptoms are more appropriate.

[Response] We agree on your opinion that symptom does not equal to disorder. We have revised it to ‘symptom’ according to your comments.

In abstract, interaction effect is unclear. Is this individual-level interaction or cross-over interaction effect?

[Response] All interactions terms were composed of individual level variables. We have now clarified this in abstract section (also in the main text). Thanks a lot for giving us the opportunity to make it clear.

#### Reviewer: 2

We authors deeply appreciate the constructive comments. We have summarized the revision as follows.

#### Methods

Page 6, line 13: What are the 8 regions in Korea? Consider providing as footnote.

[Response] Sorry for missing important information. We have added specific names of 8 regions in parentheses.

Page 6, line 15: What is the government-subsidized health examination? i.e., how often are residents visiting the hospital for their health examination or at which time points or age? Please elaborate as many of the readers may not be familiar with this.

[Response] The health examination is provided by National Health Insurance Service biennially for free to all Korean adults aged over 40 for as a public service for health promotion and disease prevention. We have supplemented this information in sub-section of ‘data source’ under the ‘Method’ section

Page 6, Outcome Variable: I wonder if you can provide some reliability and validity numbers here for the outcome variable.

[Response] Regrettably, we are not able to provide the numbers for our Korean target population regarding the reliability and validity test. However, there are several papers on the reliability and the validity of CES-D scale performed on various population group. We have added citation of those studies as references (rather than presenting all the figures in our paper).

Page 7, Social Support: Is this a reliable and valid scale (i.e., social experiences checklist)?

[Response] We apologize that we might have given you some confusion. Our social support questions did not come from social experiences checklist, which is asking about whether respondent

have experienced exchange of certain kinds of positive or negative social support. Instead, we used questions asking whether respondent have a person around them who can give certain type of positive or negative support. This question list was adapted in reference to a few set of survey questions on social support or social exchange from other countries. Regretfully again, we did not conduct reliability and validity test of social support questions in our own population.

Page 8, Lines 41-42: Can you provide the currency equivalent in dollars as well as provided in the tables as a footnote? It would be helpful to know the low income cut-off or what is deemed as “poor” as you mention throughout the paper. Is being in the <100 Korean Won category considered as “poor”?

[Response] We are sorry not to provide more sufficient information in the previous manuscript. Although we already provided currency rate of Korean Won in dollars as a footnote in each table, we have now added each cut-off values for income categories in dollars within the text in sub-section of ‘other explanatory factors’ under the ‘Method’ section. For your information, poverty line of Korea in 2017 is as in table below. Considering average number of household member in Korea is 2, lowest level of income in our categorization can be recognized as “poor”

Number of

	household member	
	Korea Won	US\$
1	495,879	440
2	844,335	749
3	1,092,274	968
4	1,340,214	1,188
5	1,588,154	1,408

Page 9, Lines 38-54: Does model 3 correspond to the figures 2 and 3 provided in the manuscript? It would be helpful to elaborate.

[Response] We are sorry about insufficient information to the prospective audience. We have now made it clear in relevant parts. In this revised version, Figure 2 and 3 correspond to the model 5 in Table 2.

Results

What was the % missing for each of the model?

[Response] We apologize our insufficient explanation in the previous manuscript. All the models are equal in analytical sample size as shown in Figure 1. We have added footnote explaining this under the Table 2

And the overall R-squared?

[Response] Thanks for suggesting good points. We have estimated R-square values and added in table 2.

Was the model tested for multi-collinearity?

[Response] We also have examined multicollinearity by checking Variance Inflation Factor (VIF) and have found no multicollinearity among predictors. We have commented this result in the sub-section of 'statistical analyses' under the 'Method' section.

Why were the 8 regions or communities added as part of a covariate?

[Response] It seemed that reviewer comment had typo in this part. We thought the reviewer was trying to ask us why 8 regions or communities were "not" added as part of covariates. Multilevel design considers the variation between community (second level in our multi-level design) as random effect (meaning it is assumed that communities are drawn from a larger sample and thus represent them) rather than fixed effect (meaning they have the specific same value in any study, not representative value of the larger sample). Therefore, community is not included as fixed effect variables when it represents unit of level in multi-level model. However, cluster effect is adjusted well by treating it as level 2.

Page 10, Line 24: Figure 1 shows that 14 communities were analyzed with 21,208 respondents but in the text here it says 15 communities. Please revise.

[Response] We apologize making readers confused. 25,712 in 15 communities is the number of respondents in the original survey. The number of final analytical sample is 21,208 in 14 communities. We have made it clearer in the manuscript. Thanks a lot for giving us the opportunity to make clear of it.

Page 10, Lines 25-33: What was the range of the depressive symptoms scores for these covariates?

[Response] If our understanding is right that this comment is asking about range of depressive symptom according to the marital status, it is between 4.25 and 8.07. We have added detailed score of depressive symptom within the relevant sentence.

Page 11: I understand that the two can be treated as separate domains of experience but have you examined the correlation between positive social support and negative social support? I would imagine that those who report high level of positive social support would be reporting low negative social support.

[Response] Thank you for commenting important point. This was also pointed out by another reviewer. We have checked correlation between positive and negative support and statistically significant negative correlation was found although coefficient size is very small. We have now presented the result of correlation test in sub-section of 'statistical analysis' in 'Method' section and also in supplementary table 3

## Discussion

Page 16, Line 5-6: How would the information on suicidal behaviour among adolescents and college students relate to older adults 40-69 years of age (which is your sample)? Are there any literature out there for this particular age group on suicidal behaviour and social support? If not, please state some implications.

[Response] We are sorry about the unclear explanation in the previous manuscript. We cited those papers based on our thought that negative social support would have the similar effect regardless of age (although effect size might be different). However, we agree on your opinion that studies performed on the same age group would give more 'make-sense' implication on our discussion. Therefore, we have narrowed down the scope of previous studies only to the ones performed on the same age population group as ours. Thanks a lot for your critical comments.



The discussion section talks about suicide rates, and seems to imply that depressive disorders may be a predictor given that only a few of them seek consult or counselling. Is there literature out there to support this? Perhaps, it will be also helpful to include this in the introduction.

[Response] We appreciate for your pointing missing point out, which would be an important conceptual bridge for the readers. Yes, depression is well known as one of the predictor for suicide and this was proved in previous studies many times. We have now added this in Introduction section with relevant citation.

Limitations:

Should also account for older data – the data analyzed for this study was 2009-2010 (already 7-8 years old) – has much changed over the last few years?

[Response] Thanks for your comment. Yes, we understand your concern. However, survey for the first wave of HEXA examinee study was finished in 2013 and second wave data has not gone public yet. So dataset we used were the latest one available. Although we don't expect there would be much change in pattern of association between positive or negative support and depressive symptom since then, future research with more recent data (round 2 data) needs to be explored when it becomes available.

Tables:

Keep decimal places consistent. Some have only 1 decimal place and some have no decimal places.

It would be helpful to have a list of the covariates in each of the models as a footnote.

[Response] Thanks for your careful comments. All your comments have been reflected in the Tables now in the revised manuscript.

### VERSION 2 – REVIEW

<b>REVIEWER</b>	Tae Kyoung Lee University of Miami Miller School of Medicine
<b>REVIEW RETURNED</b>	24-Jul-2018

<b>GENERAL COMMENTS</b>	<p>Thank you for the opportunity to read the revised version of this manuscript. Overall, the authors addressed the issues raised by the reviewers and conducted additional analyses that were satisfactory. This paper will definitely contribute to the literature. I only have several issues that emerged from my read of the revised paper that should be address before considering the paper for acceptance.</p> <p>Abstract:</p> <p>1. In line 12 of Page 3, it seems that authors misinterpreted the results. “The interaction between positive and negative social supports revealed that one domain of social support mediates the effect of the other domain of social support on depressive symptoms”. Is this mediating or moderating effect?</p> <p>Introduction</p>
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	<p>2. Authors mentioned about the importance of depressive symptoms by mentioning the direct effect on suicide. However, I wonder whether this effect is universal. Given that the study used Korean sample, is it necessary to describe (at least briefly) the importance of depressive symptom with Korean population? I found that authors mentioned this in discussion section. However, I think that it will be helpful for readers to introduce issue of depressive symptoms with Korean population.</p> <p>3. I think that authors need to re-organize the sequence of introduction. In the purpose of the study section (see line 43 of page 5), authors wrote three research questions. These questions helps to understand the purpose of the study. However, the way that authors mentioned in introduction does not follow the sequence of research questions. In introduction, it seems that authors first mentioned literatures for research question 1, followed by those for questions 3, then mentioned for question 2. It would be helpful to re-organize to meet the same sequence between intro and research questions.</p> <p>4. In the line 50 of page 5, authors still used the term “mediate”. Is it correct? Moderate?</p> <p>Measure</p> <p>5. Given that authors used composite summed scores for main outcome, CES-D, Please mention reliability (e.g., Cronbach’s alpha) for CES-D scale.</p> <p>6. For model specification, authors used several aggregated scores for community level predictors. However, similar predictors exist at individual-level. In this case, model will estimate contextual effect</p> <p>Discussion</p> <p>7. In line 10 of page 19, the interpretation is unclear. Plus, again, I am not sure whether authors confuse the term between “mediate” and “moderate”. All analytical approach emphasized on moderating effects.</p> <p>Minor:</p> <ul style="list-style-type: none"> <li>• In abstract, please add age information (mean and standard deviation) of sample.</li> <li>• In supplemental table 4, Authors mentioned that all coefficients were estimated from model 8 in table 2. Is this model 6 in table 2?</li> </ul>
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<b>REVIEWER</b>	Theresa Kim The Hospital for Sick Children, Research Institute, Canada
<b>REVIEW RETURNED</b>	17-Jul-2018

<b>GENERAL COMMENTS</b>	<p>Positive and negative social support and depressive symptoms according to economic status among adults in Korea: A multilevel regression analysis</p> <p>The objective of the paper was to determine the associations of social support and depressive symptoms, stratified by positive and negative social support, and examining this association by</p>
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economic status of Korean adults. The research question is interesting, and an important one, given the rise of suicidal rates in Korea as the authors mention, and how the depressive symptoms are largely related to suicides. Overall, the revised paper has improved however, there are some minor changes required (mostly revising statements and grammar errors).

Abstract:

- Under objectives, please delete the second “between” on line 2.
- This statement is a bit confusing: “These associations were proved to be stronger in lower income group in tests for interaction terms of household income and each domain of social supports.” Considering revising the statement with: “These associations were proved to be stronger when the interaction terms with household income and social supports were examined among the lower income group.”
- Please briefly indicate what “stronger” means in abstract. The following statement also requires revising. Referring to: “These associations were proved to be stronger in lower income group in tests for interaction terms of household income and each domain of social supports.”
- Which domain are you referring to? Please revise the statement, it is unclear: “The interaction between positive and negative social supports revealed that one domain of social support mediates the effect of the other domain of social support on depressive symptom.”

Strengths and Limitations of the Study box:

- Remove “a” before the word “cross-sectional”

Introduction:

- Last paragraph of the introduction, consider revising this statement: “The first, are positive and negative [...] Finally, is the effect of positive or negative support more pronounced for less affluent individuals?” TO □ “First, are positive and negative support independently associated with depressive symptoms? Second, do the two domains of social support mediate the effect on depressive symptom? Third, are the effects of positive and negative support more pronounced among less affluent individuals?”

Methods: Data Sources:

- First paragraph of data sources, add the word “the” in front of the word “National Health Insurance...”
- Last sentence of first paragraph, please revise statement to past tense: “This way of recruiting provides [...] majority of the Korean population.”

Discussion:

- Please revise the word “unprotectedness” – suggestion: “feeling unprotected”

Table 1:

- Keep decimal places consistent. Some have only 1 decimal place and some have no decimal places. See table 1

Minor:

- Spacing throughout the text – please carefully check over spacing within text.

## VERSION 2 – AUTHOR RESPONSE

Reviewer 1

Reviewer Name: Tae Kyoung Lee

Institution and Country: University of Miami Miller School of Medicine, USA

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

Thank you for the opportunity to read the revised version of this manuscript. Overall, the authors addressed the issues raised by the reviewers and conducted additional analyses that were satisfactory. This paper will definitely contribute to the literature. I only have several issues that emerged from my read of the revised paper that should be address before considering the paper for acceptance.

Abstract:

1. In line 12 of Page 3, it seems that authors misinterpreted the results. “The interaction between positive and negative social supports revealed that one domain of social support mediates the effect of the other domain of social support on depressive symptoms”. Is this mediating or moderating effect?

[Response] We appreciate pointing out our critical mistake. We are very ashamed of this absurd mistake. While moderation and meditation are totally different concept, people frequently get confused and use them interchangeably. The effect that can be investigated by interaction term is not mediating effect, but moderating effect. We have now replaced the term in all relevant parts. Again, thanks a lot.

2. Authors mentioned about the importance of depressive symptoms by mentioning the direct effect on suicide. However, I wonder whether this effect is universal.

[Response] We understand the reviewer’s concern. Although the depression is the most important factor of suicide, we cannot be sure whether the trend of suicide rate is directly driven by the change of depression prevalence in any context. At least, we could confirm that this is true in Korea in relevant papers. Thus, we have now modified relevant paragraph to limit the meaning of the sentence only within Korea in Discussion section (Next to the last paragraph on page 20) not to make any confusion.

3. Given that the study used Korean sample, is it necessary to describe (at least briefly) the importance of depressive symptom with Korean population? I found that authors mentioned this in discussion section. However, I think that it will be helpful for readers to introduce issue of depressive symptoms with Korean population.

[Response] We agree on the reviewer’s recommendation that providing the brief statement about depression in Korea in introductory part is necessary. We have now added a sentence in the next to the last paragraph in Introduction section (page 6). Thanks a lot for this suggestion.

4. I think that authors need to re-organize the sequence of introduction. In the purpose of the study section (see line 43 of page 5), authors wrote three research questions. These questions helps to understand the purpose of the study. However, the way that authors mentioned in introduction does not follow the sequence of research questions. In introduction, it seems that authors first mentioned literatures for research question 1, followed by those for questions 3, then mentioned for question 2. It would be helpful to re-organize to meet the same sequence between intro and research questions.

[Response] We totally agree with the reviewer's opinion that presenting the issues needs to be re-organized for reader to follow easily. We have now realigned structure of introduction with the sequence of research questions.

5. In the line 50 of page 5, authors still used the term "mediate". Is it correct? Moderate?

[Response] As mentioned in answer to comment 1, we have corrected all relevant parts.

Measure;

6. Given that authors used composite summed scores for main outcome, CES-D, Please mention reliability (e.g., Cronbach's alpha) for CES-D scale.

[Response] Thanks for the advice. Although we had not presented Cronbach's alpha in the text of the previous manuscript, we cited the papers on reliability of CES-D scale as references. According to the reviewer's comment, we have now provided the figures of Cronbach's alpha in sub-section of outcome variable under the method section.

7. For model specification, authors used several aggregated scores for community level predictors. However, similar predictors exist at individual-level. In this case, model will estimate contextual effect

[Response] We are well aware that the compositional effect is distinguished concept from contextual effect. Our purpose was to explore the effect of individual-level social support on depressive symptom when controlling for the contextual effect of SES characteristics of the people who are living together on depression. Specifically, those with a same level of individual income would feel a different level of depressive symptom depending on whether he or she lives in high or low income community (contextual effect). It turned out that there was no contextual effect related to community SES and only there was individual SES effect (compositional effect). We added this explanation in the last paragraph in the sub-section of "other explanatory factors" under the methodology section.

Discussion

8. In line 10 of page 19, the interpretation is unclear. Plus, again, I am not sure whether authors confuse the term between "mediate" and "moderate". All analytical approach emphasized on moderating effects.

[Response] We have now corrected "mediate" to "moderate" and also have presented it in a different way so that readers can understand more easily referring to the figures. Thanks a lot for pointing it out such that we can have chance to improve it.

Minor:

9. In abstract, please add age information (mean and standard deviation) of sample.

[Response] As your suggestion, we presented mean and standard deviation of age for target population in the sub-heading of "participants" in an abstract.

10. In supplemental table 4, Authors mentioned that all coefficients were estimated from model 8 in table 2. Is this model 6 in table 2?

[Response] We apologize for making audience confused. What you found out was our typos so we have now corrected it. Thanks a lot.

Reviewer 2

Reviewer Name: Theresa Kim

Institution and Country: The Hospital for Sick Children, Research Institute, Canada

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

Positive and negative social support and depressive symptoms according to economic status among adults in Korea: A multilevel regression analysis

The objective of the paper was to determine the associations of social support and depressive symptoms, stratified by positive and negative social support, and examining this association by economic status of Korean adults. The research question is interesting, and an important one, given the rise of suicidal rates in Korea as the authors mention, and how the depressive symptoms are largely related to suicides. Overall, the revised paper has improved however, there are some minor changes required (mostly revising statements and grammar errors).

[Response] Overall, we are beyond grateful for reviewer's close review and comments!

Abstract

1. Under objectives, please delete the second "between" on line 2.

[Response] We have now deleted the word "Between"

2. This statement is a bit confusing: "These associations were proved to be stronger in lower income group in tests for interaction terms of household income and each domain of social supports." Considering revising the statement with: "These associations were proved to be stronger when the interaction terms with household income and social supports were examined among the lower income group."

3. Please briefly indicate what "stronger" means in abstract. The following statement also requires revising. Referring to: "These associations were proved to be stronger in lower income group in tests for interaction terms of household income and each domain of social supports."

4. Which domain are you referring to? Please revise the statement, it is unclear: "The interaction between positive and negative social supports revealed that one domain of social support mediates the effect of the other domain of social support on depressive symptom."

[Response] Considering the three comments above together, we have decided to change the expression as below.

Original :

These associations were proved to be stronger in lower income group in tests for interaction terms of household income and each domain of social supports. The interaction between positive and negative social supports revealed that one domain of social support mediates the effect of the other domain of social support on depressive symptom.

Revised :

When the interaction terms among household income and social supports were examined, negative associations between positive social support and depressive symptom was more pronounced as income was lower and negative social support was higher. Similarly, positive association between negative social support and depressive symptom was more pronounced as income was lower and positive social support is lower.

## Strengths and Limitations of the Study box

5. Remove “a” before the word “cross-sectional”

[Response] Thanks for detailed review. We have now deleted it.

## Introduction

6. Last paragraph of the introduction, consider revising this statement: “The first, are positive and negative [...] Finally, is the effect of positive or negative support more pronounced for less affluent individuals?” TO □ “First, are positive and negative support independently associated with depressive symptoms? Second, do the two domains of social support mediate the effect on depressive symptom? Third, are the effects of positive and negative support more pronounced among less affluent individuals?”

Response) We appreciate clarifying the research questions. We have now changed the wording for our research questions as below based on your comments with some help from a English editor.

Revised :

The first, are positive and negative support independently associated with depressive symptoms? Second, do positive social support moderate the effect of negative social support on depressive symptom or vice versa? Finally, are the effects of positive and negative support more pronounced for less affluent individuals?

## Methods: Data Sources

7. First paragraph of data sources, add the word “the” in front of the word “National Health Insurance...”

Response) We are really grateful for your detailed comment. We have added “the” now .

8. Last sentence of first paragraph, please revise statement to past tense: “This way of recruiting provides [...] majority of the Korean population.”

Response) Thanks for suggestion. Recruiting the target population through biennial health examination facilitated (and facilitates) follow-up of the survey target population. The advantage of recruiting method is not only one-time event but also repeated one, which can be benefitted every biennial context. Based on the reviewer’s comments, we have now changed the sentence from “This way of recruiting provides [...]” to “ This way of recruiting can provide [...]”

## Discussion

9. Please revise the word “unprotectedness” – suggestion: “feeling unprotected”

Response) Thanks for pointing out. We have now made it clear by replacing the expression with “feeling of being unprotected or being isolated caused by negative social support”.

## Table 1

10. Keep decimal places consistent. Some have only 1 decimal place and some have no decimal places. See table 1

Response) Thanks. We have now revised them with consistency.

## Minor

11. Spacing throughout the text – please carefully check over spacing within text.

Response) We deeply appreciate your careful review and comments. We have checked and revised them in relevant parts.

**VERSION 3 - REVIEW**

<b>REVIEWER</b>	Tae Kyoung Lee University of Miami Miller School of Medicine
<b>REVIEW RETURNED</b>	29-Nov-2018

<b>GENERAL COMMENTS</b>	I did not have any serious concerns about the initial submission. And I'm impressed that the authors have carefully responded to my minor critiques.
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