

Response to RC1 Comments

Dear reviewer,

We highly appreciate your valuable comments and suggestions. It has greatly improved the quality of our manuscript. We have made revisions one by one according to your comments and suggestions.

The answers for the suggestions and comments are as follows.

Q1: If possible, indicate the four community types (Type 1 - Type IV) in the Wuhan and Hongshan District map (Figure 2)

Authors' responses:

Thanks for your valuable suggestions. According to your suggestion. We've indicated the 11 communities in the Hongshan District map (Fig. 2), as follows.

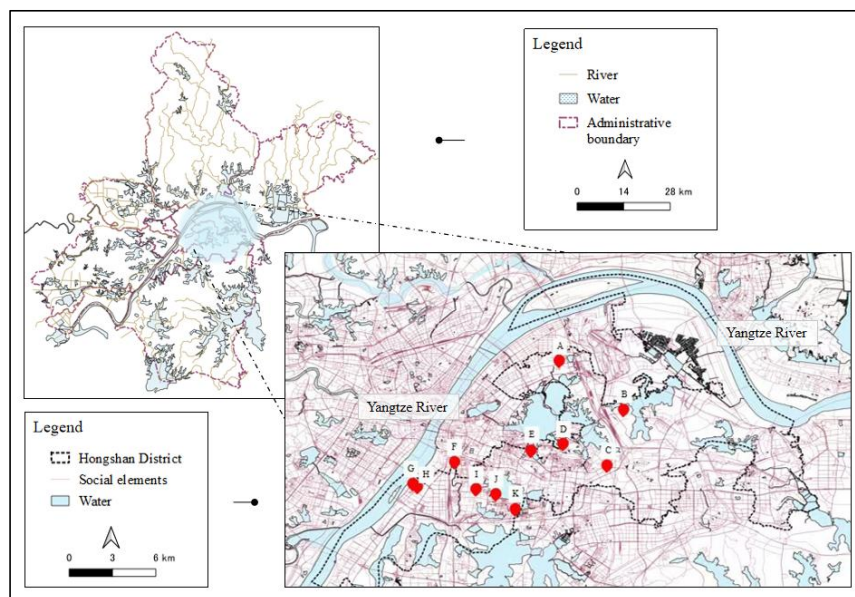


Figure 2. Geographical features and administrative boundaries of Wuhan City and Hongshan District. The points of A-K show the locations of the communities where the questionnaire surveys were conducted.

Q2: In the methods section, the authors should clarify how the data were “weighting” in this context. For example, are you weighting the survey data to be representative of the target community and for non-response bias or are you applying a weighting algorithm to give more importance to certain measures of vulnerability?

Q3: Section 3.2 (Determination of weight): This section needs much more detail. Describe how you selected experts, the response rate, demographics of experts, methodology for eliciting ratings including the modality (in person, by phone/email, etc.), what prompts did you use, what scale did you

provide, how did you define each of the 15 indicators for the experts, etc. If the AHP method you used followed a standard procedure, please at least include a citation. Define what first-level and second-level index means. Describe how you “check the consistency of the judgment matrix”. Include an interpretation of CR, CI, and RI for the reader.

Authors’ responses:

Thank you very much for your comments. Firstly, we will explain the weighting part of the methodology. The empowerment of this study mainly adopts a combination of expert scoring method and Analytic Hierarchy Process. The calculation of the weight of this method is not based on research data, but on the scores given by the experts, that is different from methods such as principal component analysis and entropy method. After obtaining the weights of each indicator, combined with research data, the vulnerability of residents is calculated. Therefore, the purpose of weighting is to calculate vulnerability. Each weighting method has its advantages and disadvantages, and we have explained the reasons for choosing this method in the manuscript.

For consistency testing, generally, when the consistency ratio $CR < 0.1$, it is considered that the consistency of the judgment matrix is acceptable, otherwise it needs to be corrected. 0.1 is the best solution obtained by the original author (Saaty 1980) through multiple Monte Carlo simulations. As this step is a necessary step in the Analytic Hierarchy Process, we have added references according to your suggestions when making revisions to facilitate better understanding by readers.

For the expert scoring method, the explanation in the manuscript is indeed not detailed enough, and we have made modifications: By snowball sampling, we firstly invited ten experts who are out of our research group from three countries (China, Japan and Indonesia) through email, including local people with disaster experience, local scholars with disaster experience, and/or researchers on related issues in sociology and geographers. By sending Table 2 (including explanations for each indicator) in a Word file, and specifying the steps for scoring 15 variables related to social vulnerability according to the degree of importance (Very important=5, More important=4, General important=3, Less important=2, Not important=1), we got feedback via email from all experts. There are no other prompts, and the expert response rate is 100%.

Q4: Page 9, lines 27-31: This main idea of paragraph is ambiguous. Are the authors arguing that migrants are de-stabilizing the adaptive capacity of a community or are the authors highlighting the reduced adaptive capacity of migrant individuals?

Authors’ responses:

Thank you very much for your comments. For page 9, lines 27-31 in the original manuscript, after our discussion, we think that it is not very helpful in explaining the content of this section, so we have deleted it.

Q5: Section 3.3. (Data collection and analysis): This section is lacking in important details needed to evaluate the quality of the data generated from the survey. The authors should describe how they

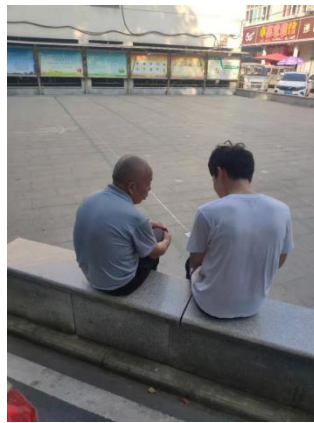
determined a minimum sample size, how they constructed a sampling frame, and if they stratified communities based on demographic characteristics (e.g., migrant status). The authors should also include a description of the survey questions used to assess social vulnerability factors, how the survey was administered to respondents, and the refusal/non-response rate? The authors do not indicate that the survey data was weighting to account for demographic differences and/or non-response. The lack of weighting seriously undermines the generalizability and validity of the survey data. Without any indication that the data collected are representative of the underlying community, it is inadvisable to extrapolate the results beyond the sample of individuals included.

Authors' responses:

Thanks for your valuable suggestions.

About data collection, we have supplemented it based on your suggestion. Selecting the sampling method, it was taken into account that many urban migrants, especially low-skilled and low-secured representatives of migrant workers, were not fully included in the official urban population list. Therefore, we adopted the method of quota sampling to determine the sample size of each community based on the official data, and the preliminary research and interview data. Then, the required quantity for each community is determined in advance through mutual control quota analysis of the age, gender and household registration characteristics of the surveyed samples, and then distributed face-to-face until the target quantity is collected (Please see the pictures below).

The classification of the four types of communities is based on the official records, socio-economic data, the landscape of the community, and the determination of the number of different types of communities is also based on the preliminary research information. However, due to some communities not being allowed to enter during the research process, a total of 599 questionnaires were obtained from 11 communities.



Q6: Section 3.2 (lines 24-26, Calculation of Final Weight): This section requires much more detail. I don't understand what the authors are referring to in Step 2 (final weight) if Step 3 describes how they calculated the final weight.

Authors' responses:

Thank you very much for your comments. We are sorry for our mistake. In fact, steps 2 and 3 are one step, just in order to get more scientific results, we take the Arithmetic average, Geometric average, and Eigenvalue to calculate the weights, and then regard the average as the final weight of each indicator. We have made revisions in the manuscript.

(1) Use the judgment matrix to calculate the weight of each indicator (including the first-level index and the second-level index), and check the consistency of the judgment matrix.

In the consistency test (Saaty 1980; Lane and Verdini 1989; Lin et al. 2013), the random consistency

ratio in the judgment matrix is: $CR = \frac{CI}{RI}$ ¹

And the results of CR in all the matrices are less than 0.10.

(2) Calculate the final weight of each indicator. To get a more scientific result, we take the Arithmetic average, Geometric average, and Eigenvalue to calculate the weights, and then regard the average as the final weight of each indicator (Table 3).

Q7: Figure 5: This figure is difficult to visually interpret. I suggest using a more simplified chart to display the distribution of each of these dimensions separately.

Q8: Figure 6: Trend lines for each plot in scatter plot matrix would help with interpretation.

Authors' responses:

Thank you very much for your valuable suggestions. We attempted to add trend lines to Figure 6, but the effect was not good and did not help explain this figure. Therefore, we have added an explanation to Figure 4-6 to help readers better understand the information they are intended to show, as follows:

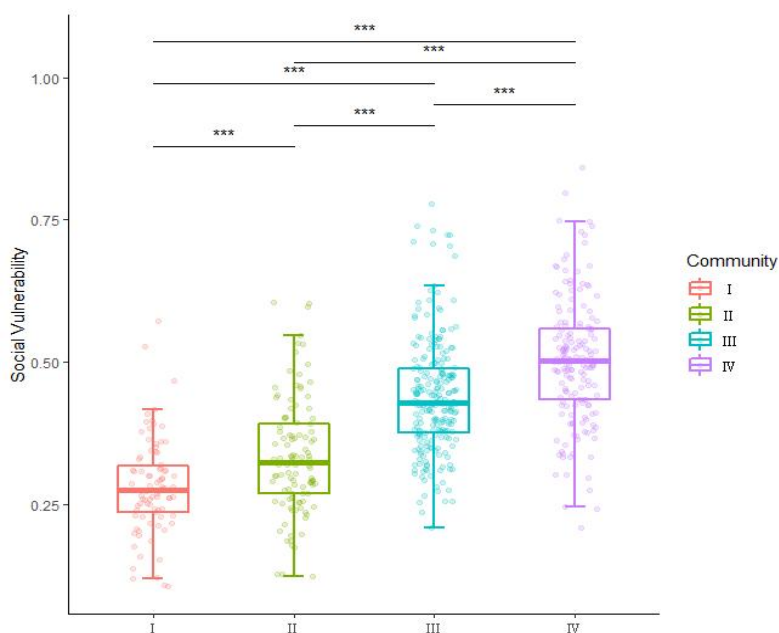


Figure 4. Social Vulnerability Box Plot of 4 type communities. The boxplot in is used to represent the central location and distribution range of vulnerability data for the four types of communities, and to

¹ Consistency ratio (CR); Consistency index (CI); Random consistency index (RI)

compare them. The four colors represented in the legend represent four different community types, each consisting of multiple communities (see Table 1). There is a line in the middle of the box, representing the median of the data; The top and bottom of the box are respectively the upper quartile (Q3) and the lower quartile (Q1) of the data; The top and bottom lines represent the maximum and minimum values of the group of data, respectively. Some points distributed outside represent outlier in the data. This figure can not only show the distribution, outlier, fluctuation and stability of each type of community vulnerability, but also compare the difference of distribution and value of different types of community vulnerability. *Note: $p < .01^{***}$ ($= .000$)*

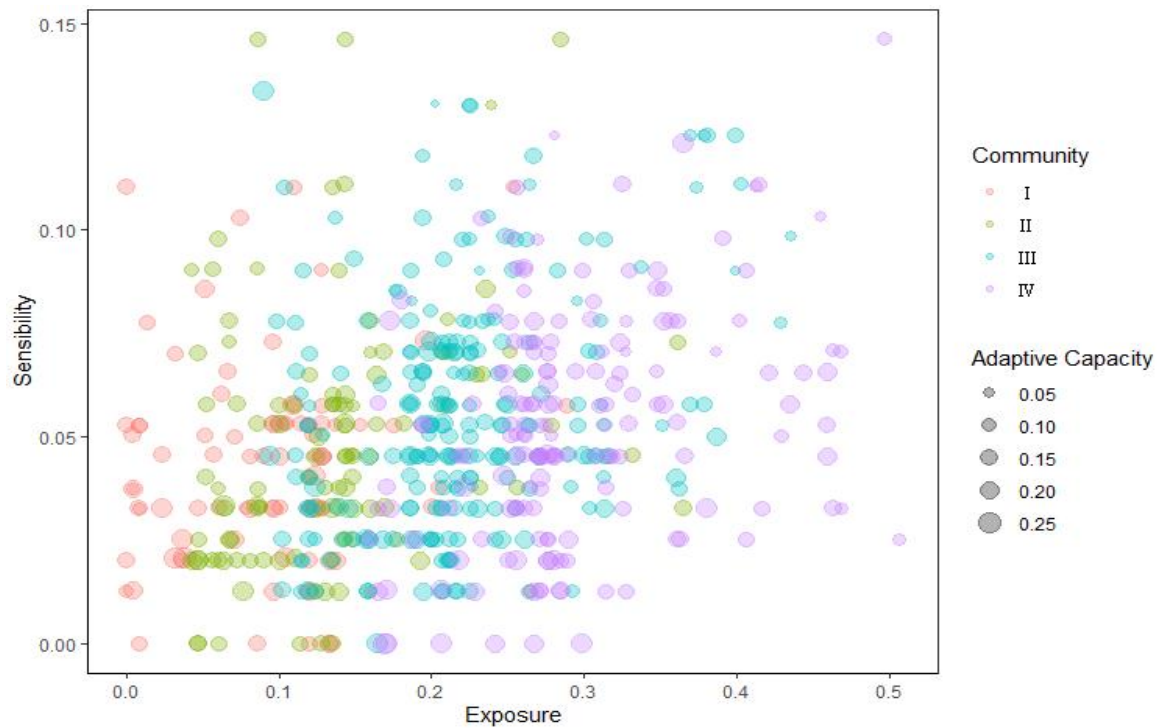


Figure 5. Exposure, sensitivity, and adaptive capacity of four types community. The bubble chart shows three variables (exposure, sensitivity, and adaptability) for four types of communities. Exposure and sensitivity correspond to values on the X -axis and Y -axis, respectively, and adaptability is represented by the size of the bubble. The four different colors in the legend represent four types of communities, and the dot size is used to explain the size of adaptability. Through Figure 5, not only can the overall exposure, sensitivity, and adaptability of the study area be displayed, but also the differences in exposure, sensitivity, and adaptability of different types of communities can be compared.

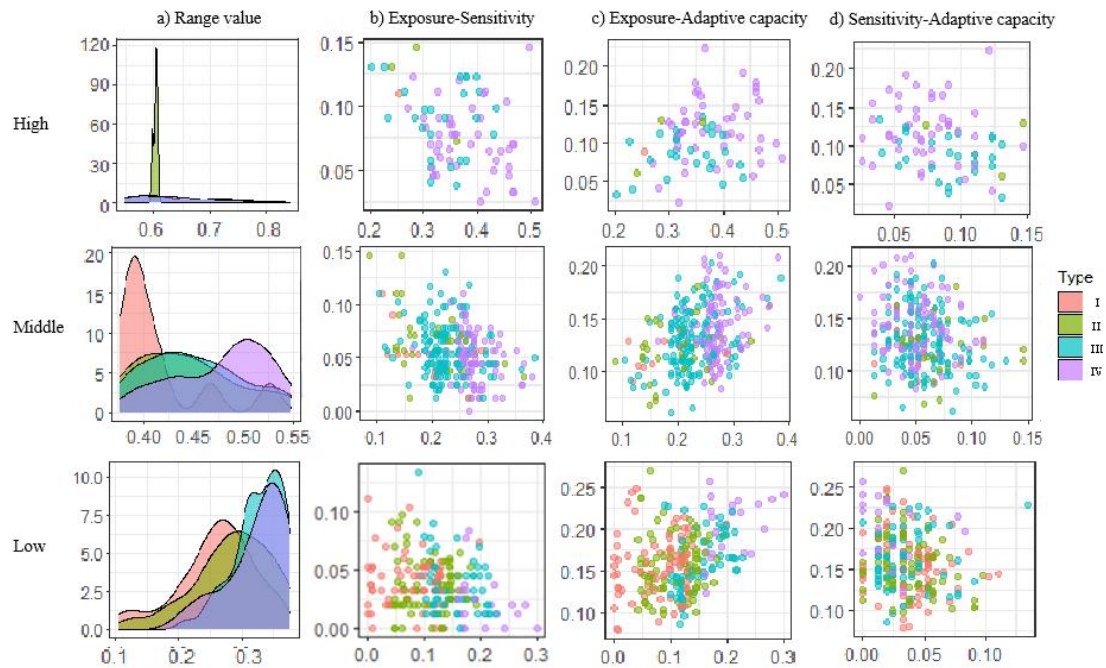


Figure 6. The distribution and characteristics of high, medium and low-level vulnerability. The figure horizontally represents the distribution of high, medium, and low vulnerability populations in the four types of communities. Vertically, a) Range value is the nuclear density curve of the vulnerable population, with a higher peak indicating a more concentrated level of vulnerability (with smaller differences in vulnerability). Conversely, a lower peak indicating a more dispersed level of vulnerability (with larger differences in vulnerability). At the same time, the concentration range of its vulnerability values can be determined; b) Exposure-Sensitivity represents the correlation between the exposure and sensitivity of vulnerable populations in the four types of communities, with the X-axis indicating exposure and the Y-axis indicating sensitivity; c) Exposure-Adaptive Capacity represents the correlation between the exposure and adaptability of highly vulnerable populations in the four types of communities, with the X-axis indicating exposure and the Y-axis indicating adaptability; d) Sensitivity-Adaptive capacity represents the correlation between sensitivity and adaptability of vulnerable populations in the four types of communities, with the X-axis indicating sensitivity and the Y-axis indicating adaptability.

Q9: Table 5: It is more informative to show the percent of individuals in each community type that were high/mid/low vulnerability than the percent of individuals in each vulnerability category that lived in each community. For example, you show that 61% of high-vulnerability individuals lived in Type IV communities. However, only 27.6% of individuals who lived in Type IV communities are classified as high-vulnerability.

Q10: Page 17, lines 5-6: The authors state that, “The disparity in social vulnerability among inhabitants in various neighborhoods implies “residential segregation” in the metropolitan environments”. However, their previous statement appears to contradict this conclusion: “A previous study (Turner et al. 2003) found that not only do social vulnerabilities vary between societies, communities, and groups, but also among residents in the same area/community. We have verified that using quantitative analysis receives similar findings (see Figure 5).”

Authors' responses:

Thank you very much for your comments. The main purpose of Table 5 is to display the distribution of populations with different vulnerabilities (high, medium, and low) among the four communities, rather than to clarify the distribution of populations with high, medium, and low vulnerabilities in the same type of community. This can also support the phenomenon of residential segregation mentioned in lines 17 and 5-6. We want to compare the vulnerability of residents between different communities rather than those within the same type of community. In addition, the research results presented in 4.1 and 4.2 are from different perspectives. Figure 5 shows social vulnerability between societies, communities, and groups, but also among residents in the same area/community. This is similar to previous research results, so we mentioned the study by Turner et al. 2003.

Q11: Page 19, lines 20-21: I believe that the authors are implying that occupation, household registration, gender and debt cannot reflect the variations in individual social vulnerability because there are no natural quantitative hierarchies to these factors. If so, that argument should be made more explicit. However, I would argue that it would be informative to show the proportion of individuals within each vulnerability group that belong to a specific vulnerable group (e.g., percent of workers employed in low-skill occupations, percent of individuals without household registration, etc.).

Authors' responses:

Thank you very much for your valuable suggestions. For Page 19, lines 20-21, we apologize for the unclear statement. What we actually want to express is that occupation, residence registration, gender and debt are categorical variables. Different from the continuous variables such as age and education in Table 6, their values cannot reflect individual vulnerability, so they cannot be put in Table 6. Then, we use Figure 7 to show the relationship between occupation, registered residence and vulnerability. In addition, the data results do not reflect the correlation between gender, debt and vulnerability, and it was not shown in the manuscript.

Q12: Page 20, lines 22-23: It is unclear the conclusion the authors present ("Although there are also some low-vulnerability individuals with the rural household registration, it can be argued that they are mainly engaged in state-owned enterprises, including public service units"). is supported by the survey data or if this is a hypothesis extrapolated by the authors.

Authors' responses:

Thank you very much for your comments. We found the results through data analysis of their occupational types, and we have made modifications to this sentence, as followed:

Although there are also some low-vulnerability individuals with the rural household registration, by analyzing their occupational types, it can be found that they are mainly engaged in state-owned enterprises, including public service units.

Q13: Page 16, line 20: The author indicate that communities of Type III have fewer scores than those of Type IV in terms of exposure and adaptive capacity, higher in sensitivity. I believe that they might have meant lower rather than fewer scores.

Authors' responses:

Thank you very much for your suggestion. Page 16, line 20 has been modified to lower scores.

For the language expression issue you mentioned, as other reviewers did not provide the same suggestions and due to time constraints, we have not made any grammar modifications this time. If you still think it is necessary, we will seek professional grammar editing services for correction in the next step.