Manuscript Title: Response Time to Flood Events using a Social Vulnerability Index (ReTSVI)

Summary: This manuscript continues to have significant problems that make it unacceptable for publication. These problems could be avoided if the authors would acknowledge that they have not identified any studies that provide empirical evidence that any of their census variables, let alone their overall social vulnerability index, is related to evacuation departure time. Consequently, their analysis doesn't show anything other than how a social vulnerability index *might be used if an empirically valid social vulnerability index were available*. For example, line 8 on page 15 would be acceptable if stated "The results of the example of ReTSVI in Huaraz show how a social vulnerability index could be used in the evacuation planning process. For example, such an analysis might show that there are distinct differences in the percentage of people evacuated in Huaraz for blocks that are close to each other". In the absence of any empirical evidence that their social vulnerability index is related to evacuation departure times, the current manuscript's conclusions are completely unsupported.

Page	Comment
3	L29. This sentence attempts to support the authors' conclusion by contrasting the conclusions of a statistical meta analysis (Huang et al., 2016) with the results from 1) one of the studies in that SMA (Bateman and Edwards, 2002), 2) a woefully inadequate narrative review that only reported confirming evidence and disregarded disconfirming evidence (Dash & Gladwin, 2007), and 3) two studies that did not in fact test whether "social vulnerability is a key factor to take into account during emergency management and evacuation planning (Chakraborty et al., 2005; Kusenbach et al., 2010). Thus, the cited studies do not support the authors' conclusion. Indeed, the authors have ignored an important aspect of the Chakraborty et al. (2005) and Kusenbach et al. (2010) studies; both of them used a small set of rationally selected indicators of evacuation vulnerability rather than this study's index of unknown relevance to evacuation that was constructed by factor analyzing an arbitrary set of census variables.

The inadequacy of the supposed support for a vulnerability index can also be seen in the claim "women, housewives, students (De Marchi, 2007) … are key variables to consider to create a social vulnerability index linked to evacuations during disasters." The report by De Marchi and her colleagues (2007)—which should actually be cited as De Marchi, Scolobig, Delli Zotti, & Del Zotto (2007)—did conclude on p. 190 that these demographic groups were vulnerable with respect to anticipation of hazards. However, they qualified this finding in the following paragraph by noting "[a]s to the phase of resistance and coping, the most vulnerable appear to be those with a low level of community embedding and with a low trust in local authorities. *The latter finding is just the opposite of that commented above pertaining to the anticipation phase, which proves that the same group may be more vulnerable at certain points in time and less vulnerable in others*" (my emphasis). More emphatically, De Marchi and Scolobig (2012, p. 317) state "[w]e maintain that one of the main problems with the operationalisation of the concept of vulnerability through indicators (see, for example, Blaikie et al., 1994; Hewitt, 1997; Anderson, 2000; Cutter, Boruff and Shirley, 2003) lies in a certain circularity of reasoning, whereby the relation between the property to be investigated and its indicators

is not clarified adequately. For instance, what is the justification for the greater vulnerability assigned a priori to women (gender being a commonly accepted vulnerability indicator)?"

Ultimately, as skeptical as I am about the value of a social vulnerability index derived from factor analysis of census data, I do not object to the authors using such an index in this paper as long as they make it clear that they are providing an example of how such an analysis would be done if they had a measure of social vulnerability that had demonstrated validity in predicting evacuation departure times. However, I do insist that they avoid claiming support of such an index from studies that do not provide such support.

5   L8. Lines 8-14 have two problems. First, this is a list of variables rather than a sentence. Second, this passage seems to be intended to repeat the claim of support for a census variable-based social vulnerability index. As noted above, none of these studies shows a reliable predictive relationship between the listed variables and any measure of people's "capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard" (Blaikie et al. 1994, 9), let alone evacuation departure times.

       L16. The authors seem to be committed to a policy of citing the results of individual studies even if those studies conflict with the evidence from a statistical meta analysis (e.g., Huang et al., 2016). If they really believe that these individual studies provide more conclusive evidence than a statistical meta analysis, they should explain their reasoning.

7   L26. The context suggests that the authors conducted 22 "interviews"; the entire process of selecting and contacting prospective respondents is a single "survey".

10   L20. A "critic" is a person who criticizes something; a "critique" is the content of the criticism.

       L29-37. PCA is a well-known and noncontroversial technique; it is only necessary to report the authors' choices of how they handled missing data (pairwise, listwise, mean substitution,), what they analyzed (correlations or covariances), which factor extraction they used, how they determined the number of factors, and which factor rotation procedure they used.

11   L1. Kaiser's criterion for the number of factors (eigenvalues greater than one) tends to extract too many factors; Cattell's scree test tends to be better (e.g., Costello & Osborne, 2005; Zwick & Velicer, 1986).

       L3. Bartlett's test is performed on the correlation matrix, so this step should be listed *before* the current step (2)

13   L13. Shaking is an instantaneous broadcast mechanism only if the entire population recognizes it as a warning cue. However, many people in the Lindell et al. (2015) and

Wei et al. (2017) studies were warned by the social contagion process because some people were unaware of the connection between earthquake shaking and tsunamigenesis.

L21. The literature, especially the literature cited in this study, mostly *speculates* that "social vulnerability has a large influence on how people respond to natural disasters." This is especially true for the relationship between measures of social vulnerability and evacuation departure times.

L31. The findings from the interviews (not surveys) are *not* "in agreement with the theory" because there were no statistically significant differences among the evacuation curves for low, medium, and high social vulnerability.

L38. Although there is no justification for discussing differences among the vulnerability groups with respect to their evacuation departure time curves, it is interesting to note that the aggregate curve is somewhat similar to the evacuation departure time curves reported in Lindell et al. (2015).

14   L1-25. This paragraph mostly repeats the erroneous claims that I have noted earlier. However, lines 10 -13 go beyond the authors' previous unsubstantiated claims by reporting a difference due to social vulnerability that they admit is not statistically significant. In addition, lines 23-24 claim, without substantiation, that the components they used "are similar if not the same to what the literature review indicated."

L38 through line 3 on the next page reports differences in evacuation rates between vulnerability groups even though there are no significant differences among the evacuation curves for the three social vulnerability groups.

References

Costello, A.B. & Osborne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation,* 10(7).

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin, 99*(3), 432-442.