

# Resilience and depression among the survivors of the 2013 Yaan earthquake

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**Yunong Huang** 

Flinders University, Adelaide, Australia

**Hung Wong**

The Chinese University of Hong Kong, Shatin, Hong Kong, China

**Yao Fu**

The University of Hong Kong, Hong Kong, China

## Abstract

- *Summary:* Recent research on disaster survivors has increasingly emphasized the concept of resilience. Little is known, however, about the relationship between community resilience and mental health and about the moderating effects of personal and community resilience on the relationship between disaster impact and mental health among disaster survivors. Based on a cross-sectional survey of the survivors of the 2013 Yaan earthquake ( $N = 495$ ) conducted in June 2014, this research examined the relationship between community economic resilience and mental health and the moderating effects of personal and community economic resilience on the relationship between disaster impact and mental health among disaster survivors.
- *Findings:* Regression analysis indicated that community economic resilience ( $\beta = -.19$ ,  $p < .001$ ) is significantly associated with depression. The relationship between earthquake impact on income and depression is moderated by community economic resilience ( $\beta = .12$ ,  $p < .01$ ) but not by personal resilience.

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## Corresponding author:

Yunong Huang, Social Work, College of Education, Psychology &amp; Social Work, Flinders University, Adelaide, Australia.

Email: [yunong.huang@flinders.edu.au](mailto:yunong.huang@flinders.edu.au)

- *Applications:* To buffer depression among disaster survivors, social workers and other mental health professionals may help enhance their personal resilience though encouraging them to develop positive attitudes toward adversities and improve community economic resilience through promoting a more effective disaster management system.

## **Keywords**

Social work, mental health, resilience, depression, stress

## **Introduction**

The role of resilience against the negative impact of traumatic events has received increased research interest in recent years (Cox & Perry 2011; Fu, Leoutsakos, & Underwood, 2013; Hickle, 2017; Lueger-Schuster et al., 2014; Ponce-Garcia, Madewell, & Brown, 2016; Walsh, 2007). Resilience is perceived by different stakeholders in different ways and has numerous definitions at different levels (Eshel, Kimhi, & Goroshit, 2014; Goode, Salmon, Spencer, McArdle, & Archer, 2017). For example, personal resilience is mainly defined in two ways: some researchers define it as a psychological or recovery outcome and reported that personal resilience is widespread among disaster survivors (Bleich, Gelkopf, Melamed, & Solomon, 2006; Bonanno, Galea, Bucciarelli, & Vlahov, 2006). Some define personal resilience as a crucial protective factor against disaster impact and against post-traumatic stress disorder (PTSD), depression, or other mental health problems among disaster survivors (e.g. Fu et al., 2013; Kukihara, Yamawaki, & Uchiyama, 2014; Rajkumar, Premkumar, & Tharyan, 2008).

Similar to personal resilience, community resilience has been defined and studied in various ways (Case, 2017). Some researchers regarded community resilience as a community factor that prevents disaster-related health or mental health problems among the residents of a community. Some define community resilience as effective organizational behavior and disaster management (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). Norris et al. regarded community resilience as a process that emerges from four primary sets of adaptive capacities, including economic development, social capital, information and communication, and community competence. Although the relationship between community resilience and mental health among disaster survivors has been rarely examined empirically, community resilience is likely to be significantly associated with mental health among disaster survivors. According to the ecological model of social environments (Bronfenbrenner, 2000) and human systems theory (Miley, O'Melia, & DuBois, 2016; Murray & Zautra, 2012), community is a key social environment of an individual's life. People live and interact with others in the community. Community is also related to the problems people face and the resources available to deal with the problems. Furthermore, community shapes people's identity,

behaviors, and life. The association between an individual's perception of community or community characteristics and mental health or the quality of life is well established and positive (Mak, Cheung, & Law, 2009; Prezza, Amici, Roberti, & Tedeschi, 2001; Wandersman & Nation, 1998).

As a protective factor against mental health problems or stresses, personal resilience might directly contribute to the mental health of disaster survivors (Fu et al., 2013; Kukihara et al., 2014) and moderate the relationship between disaster impact and the mental health of survivors as well. Resilient survivors are more likely to rapidly and successfully adapt despite challenging circumstances and traumatic experiences (Rajkumar et al., 2008). Compared with their less resilient counterparts, resilient survivors are likely to have more positive perceptions of disaster impact, recover more quickly from disaster, and feel less stressed. Therefore, disasters might have less impact on the mental health of resilient survivors. In other words, the relationship between disaster impact and mental health would be less significant among resilient survivors.

Community resilience, if regarded as the capacity of a community to recover effectively from disaster as discussed by Brown and Kulig (1996) and Paton and Johnston (2001), would also moderate the relationship between disaster impact and the mental health of survivors. On the one hand, disaster survivors who perceive their community as more resilient tend to benefit more from their communities' recovery efforts and recover more quickly from disaster impact. Therefore, the relationship between disaster impact and mental health would be less salient among survivors who report that their community is more resilient. On the other hand, disaster survivors who perceive their community as more resilient are likely to live in a community where disaster preparation is more intensive. Therefore, these survivors might expect that they would be less affected by disasters. Disaster impacts might damage their expectations and lead to worse mental health among these survivors. In this respect, the relationship between disaster impact and mental health would be more salient among survivors who report more community resilience.

Research that examines the relationship between community resilience and mental health and the moderating effects of personal resilience and community resilience on the relationship between disaster impact and the mental health of disaster survivors remains lacking. The present study sought to address this research gap. This study was based on a survey of the survivors of the Yaan earthquake, which measured 7.0 on the Richter scale and struck the Lushan County of Yaan, Sichuan, China, on 20 April 2013. The earthquake caused 196 deaths and injured 11,470 individuals, and 21 people went missing (China Earthquake Administration, 24 April 2013).

## **Method**

### *Participants and procedure*

Participants were aged 18 or above and survived the Yaan earthquake. The survey was conducted in four towns in Lushan County, the epicenter of the earthquake.

The researchers selected towns where they had contacts with social service agencies. These contacts could help researchers approach community residents. The nonprobability sampling method was used because of the limited financial support available for this research. The researchers approached people in the activity rooms of social service agencies and the homes of respondents. Of the 520 collected questionnaires, 25 were incomplete and were thus excluded from the study, leaving 495 completed and valid questionnaires.

The data were collected in June 2014 after the study was approved by the Social and Behavioral Research Ethics Committee of Flinders University, Adelaide, Australia. Face-to-face interviews using a Chinese questionnaire were conducted by eight interviewers who were trained in social research and spoke the local dialect. Of the 495 valid questionnaires, 70 questionnaires were either completely or partly filled out by the respondents. These questionnaires were checked by the interviewers for completeness. Each interview lasted from 25 to 45 minutes. Interviewers were instructed to stop interviewing and attend to the participants' needs when they had any negative emotional reaction. Before the interviews, informed oral consent was obtained from the participants given their unfamiliarity with written consent. They were also informed about the anonymity and confidentiality of their replies and that they could opt out of the study at any time.

### *Measures*

The mental health of disaster survivors was measured on the basis of depression, which has been often used to measure the mental health of disaster survivors (e.g. Chui et al., 2017; Kukihara et al., 2014; Li, Sun, He, & Chan, 2011; Moscardino, Scrimin, Capello, & Altoè, 2010; Xie, Xu, & Wu, 2017). Depression was assessed using the Chinese version of the 10-item Center for Epidemiologic Studies Depression Scale translated by Wong (2009). Research has suggested that this 10-item version can be used in lieu of the 20-item version (Cheng & Chan, 2005). The participants rated items on a Likert-type scale that ranged from 0 (rarely or none of the time) to 3 (most or all of the time). In this research, the Cronbach's alpha of the scale was 0.86.

Personal resilience was measured using the Brief Resilience Scale (BRS, Smith et al., 2008). This scale is used to assess one's ability to recover from stress and contains six items, such as "I tend to bounce back quickly after hard times" and "It does not take me long to recover from a stressful event." The scale was examined in four samples and proved to be reliable and as a unitary construct (Smith et al., 2008). The participants rated items across a Likert-type scale that ranged from 1 (strong disagree) to 5 (strongly agree). All three authors are bilingual in Chinese and English. The BRS was translated into Chinese by the first author and back translated into English by the second author. The three authors discussed and reached a consensus on the translated scale. In this research, the Cronbach's alpha of the scale was 0.73.

Given that few scales that measure community resilience were available and community resilience might include a variety of elements (Norris et al., 2008), the researchers of this study developed a new scale to measure community economic resilience and mainly focused on the recovery related to survivors' economic development, such as the recovery of transportation and shopping facilities. The scale was developed on the basis of the discussion of community resilience by Brown and Kulig (1996) and Paton and Johnston (2001) and consultations with other academicians and front-line social workers who work with disaster survivors. The scale is composed of five items: (1) My place of residence has easy transportation and a safe environment; (2) my current income is higher than that before the earthquake; (3) my current financial situation is better than that before the earthquake; (4) the community has better access to shopping and facilities after the earthquake; and (5) the time taken for shops to re-open and activities within the community to resume after the earthquake is satisfactory. Respondents were asked to indicate the degree of their agreement to each item on a 5-point Likert-type scale that ranged from 1 (strongly disagree) to 5 (strongly agree). An exploratory factor analysis was conducted to examine the scale's factor structure. All five items explained 70.12% of the variance, with the first principal component explaining 49.35% and the other components explaining 20.77% of the variance. These results suggested that the scale has a unidimensional structure. The overall score of community economic resilience was obtained by adding the scores of all five items, with higher scores indicating higher community economic resilience. The Cronbach's alpha of the scale is 0.73.

To draw comparisons across two groups of survivors of two different earthquake events, this study adopted the five measures of earthquake impact used by Huang and Wong (2014) in the study on the survivors of the 2008 Wenchuan earthquake, which also occurred in Sichuan, China. The threat to life was assessed by asking respondents whether they felt their life was in danger during the earthquake (0 = no, 1 = yes). Respondents were also asked to indicate whether the earthquake directly caused injury to or the death of their family member(s) (0 = no, 1 = yes) and their relative(s) or friend(s) (0 = no, 1 = yes). Furthermore, respondents were asked to indicate the impact of the earthquake on their house and income on a 5-point scale from 1 (none) to 5 (enormous).

This research included the following control variables: sex (0 = male, 1 = female), age (in years based on identity card), education (in years of formal education), self-rated health, and financial status. Respondents were asked to rate their health with the following question: "How would you rate your present health?" (1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good), and financial status. The respondents' financial status was measured on the basis of financial strain, which was quantified using the scale developed by Chou and Chi (2002). This scale consisted of four items. The respondents were asked to assess whether they had enough money to pay for their food, medical services, and daily expenses. The assessment used a three-point scale that ranged from 1 = enough to 3 = not enough. The fourth item asked respondents to rate the difficulty in paying

monthly bills. The assessment used a four-point scale that ranged from 1 = not difficult at all to 4 = very difficult. To ensure the consistency of responses to all items in this study, the fourth item was modified by using a three-point scale that ranged from 1 = enough to 3 = not enough. In this study, the Cronbach's alpha of the scale was 0.86.

### **Data analyses**

The data were coded and analyzed using IBM-SPSS (version 23.0) for Windows. The data were checked for the accuracy of data entry and missing values. Following Tabachnick and Fidell's (2013) suggestion, the skewness and kurtosis values of some variables were ignored given the large sample size of this study. After descriptive analyses, correlation analysis was conducted to determine whether control variables, disaster impacts, personal resilience, and community economic resilience were associated with depression. For a better estimation of effects, regression analysis was then performed. Standardized beta coefficients ( $\beta$ ) were used for effect size ( $<.10$  = small;  $.10-.25$  = medium; and  $>.25$  = large) and models were summarized using the adjusted  $R^2$  for sample size and predictors. Tests for the assumptions of co-linearity and heteroscedasticity were run and showed that there were no co-linearity and heteroscedasticity in regression analysis.

### **Results**

Table 1 presents the frequency distribution of nominal and ordinal variables and the means and standard deviations of continuous variables. Of the 495 respondents, 32.1% were male. The mean age of the respondents was 50.84 years with a standard deviation of 16.57 years. The majority of respondents reported that their lives were threatened during the earthquake and that their residences were significantly or seriously impacted by the earthquake. The mean score of depression was 9.10, suggesting that disaster survivors in this research had mild to moderate depression.

Table 2 presents the matrix of Pearson's correlation coefficients. As shown in Table 2, all five variables of disaster impact, personal resilience, and community economic resilience were significantly correlated with depression. Among the five control variables, only the variable of education was not significantly correlated with depression.

A two-step hierarchical regression analysis was performed to examine whether community economic resilience was associated with depression and whether personal resilience and community economic resilience moderated the relationship between disaster impact and depression. In the first step, the control variables that were significantly correlated with depression and the variables of disaster impact, personal resilience, and community economic resilience were entered into the regression equation. In the second step, the joint effects of personal resilience and community economic resilience with earthquake impact on income,

**Table 1.** Descriptive statistics ( $N = 495$ ).

Variable	% or Mean (SD)	Range
Male (versus female)	32.1 (67.9)	–
Self-perceived health		1–5
Very poor	4.4	
Poor	15.6	
Neutral	39.6	
Good	25.5	
Very good	14.9	
Life threatened: no (versus yes)	23.8 (76.2)	–
Injury or death of a family member: no (versus yes)	74.9 (25.1)	–
Injury or death of a relative or friend: no (versus yes)	87.5 (12.5)	–
Earthquake impact on house		1–5
No	0.6	
Negligible	3.6	
Average	8.9	
Significant	26.7	
Serious	60.2	
Earthquake impact on income		1–5
No	16.4	
Negligible	14.3	
Average	18.2	
Significant	30.7	
Serious	20.4	
Age	50.84 (16.57)	18–92
Years of formal education	6.27 (3.78)	0–17
Financial strain	8.43 (2.40)	4–12
Personal resilience	18.43 (4.38)	6–30
Community economic resilience	15.44 (3.66)	5–25
Depression	9.10 (6.24)	0–28

SD: standard deviation.

which was the only variable of disaster impact that was significantly associated with depression, on depression were examined. Table 3 summarizes the results of the regression analysis.

As shown in Table 3, the results of the first step that controlled for socio-demographic variables and disaster impact variables showed that personal resilience ( $\beta = -.21, p < .001$ ) and community economic resilience ( $\beta = -.19, p < .001$ ) were significantly associated with depression. The results of the second step showed that the relationship between earthquake impact on income and depression was significantly moderated by community resilience ( $\beta = .12, p < .01$ ). The moderation effect was illustrated in Figure 1, which presents the relationship between earthquake impact on income and depression at high ( $z = 1$ ) and low ( $z = -1$ ) levels of community economic resilience. As shown in the figure, earthquake impact on

**Table 2.** Matrix of correlation coefficients (N = 495).

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Sex	—												
2. Health	-.11*	—											
3. Age	-.09*	-.23***	—										
4. IRF	.07	.01	-.26***	—									
5. IF	.09*	.02	-.20***	.47***	—								
6. LT	.18***	-.11*	-.06	.14**	.11*	—							
7. EIH	.01	-.17***	.08	.14**	.10*	.22***	—						
8. EII	.04	-.00	-.27***	.19***	.18***	.22***	.26***	—					
9. Education	-.16***	.23***	-.61***	.24***	.11*	.02	-.09*	.14**	—				
10. FS	.02	-.30***	-.18***	.15**	.12**	.02	.13**	.14**	.07	—			
11. PR	-.14**	.16***	.08	-.03	-.02	-.07	-.08	-.08	-.12**	.02	—		
12. CER	-.03	.05	.40***	-.21***	-.13**	-.14**	-.12**	-.12**	-.36***	-.25***	-.07	—	
13. Depression	.17***	-.19**	-.29***	.14**	.16***	.15**	.10*	.33***	-.08	.26***	-.31***	-.32***	—

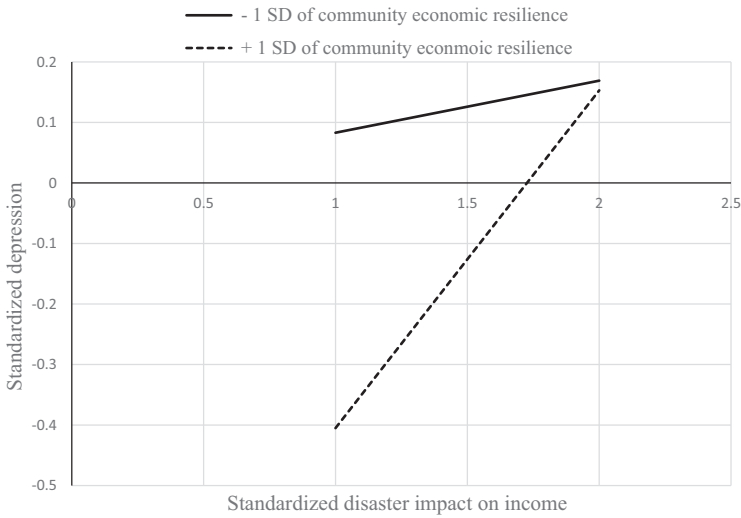
CER: community economic resilience; EIH: earthquake impact on house; EII: earthquake impact on income; FS: financial strain; IF: injury or death of a family member; no (versus yes); IRF: injury or death of a relative or friend; no (versus yes); LT: life threatened; no (versus yes); PR: personal resilience. \* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ . (two-tailed test).



**Table 3.** Regression analysis of depression.

Variable	Step 1					Step 2				
	B	95% CI	SE B	$\beta$	t	B	95% CI	SE B	$\beta$	t
Male (versus female)	1.10	[0.05, 2.14]	0.53	.08	2.06*	1.09	[0.04, 2.13]	0.53	.08	2.05*
Health	-0.90	[-1.42, -0.39]	0.26	-.15	-3.47***	-0.91	[-1.42, -0.41]	0.26	-.15	-3.53***
Age	-0.07	[-0.10, -0.04]	0.02	-.18	-3.94***	-0.07	[-0.11, -0.04]	0.02	-.19	-4.13***
Financial strain	0.24	[0.20, 0.46]	0.11	.09	2.14*	0.29	[0.07, 0.51]	0.11	.11	2.59*
IRF	-0.39	[-1.66, 0.88]	0.65	-.03	-0.61	-0.49	[-1.75, 0.78]	0.64	-.03	-0.76
IF	1.17	[-0.45, 2.80]	0.83	.06	1.42	1.13	[-0.49, 2.74]	0.82	.06	1.37
LT	0.53	[-0.65, 1.71]	0.60	.04	0.89	0.41	[-0.76, 1.58]	0.60	.03	0.69
EIH	-0.08	[-0.69, 0.52]	0.31	-.01	-0.27	-0.01	[-0.61, 0.59]	0.31	-.00	-0.03
EII	0.87	[0.48, 1.26]	0.20	.19	4.35***	0.74	[0.34, 1.14]	0.20	.16	3.61***
PR	-0.30	[-0.41, -0.19]	0.06	-.21	-5.25***	-0.29	[-0.40, -0.18]	0.06	-.20	-5.06***
CER	-0.19	[-0.34, -0.04]	0.08	-.11	-2.43*	-0.22	[-0.37, -0.06]	0.08	-.13	-2.80**
EII $\times$ PR						-0.24	[-0.69, 0.20]	0.23	.04	-1.07
EII $\times$ CER						0.71	[0.23, 1.19]	0.24	.12	2.91**
R <sup>2</sup>	0.293					0.307				
Adjusted R <sup>2</sup>	0.277					0.288				
F	18.201***					16.324***				

CER: community economic resilience; EIH: earthquake impact on house; EII: earthquake impact on income; IF: injury or death of a family member: no (versus yes); IRF: injury or death of a relative or friend: no (versus yes); LT: life threatened: no (versus yes); PR: personal resilience.  
 \* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .



**Figure 1.** Moderation effect of community economic resilience on the relationship between earthquake impact on income and depression. SD: standard deviation.

income was positively related to depression when community economic resilience was one standard deviation above the mean. However, this relationship tended to diminish when community economic resilience was one standard deviation below the mean. Earthquake impact on income was more saliently and inversely related to depression among survivors who reported higher community economic resilience.

## Discussion

The findings of this research showed that the impacts of the 2013 Yaan earthquake on income, personal resilience, and community economic resilience were significantly associated with depression among the survivors of the earthquake. The relationship between earthquake impact on income and depression was moderated by community economic resilience. The significant relationship between community economic resilience and depression among earthquake survivors supported the importance of community in people's lives as articulated by the human system theory (Miley et al., 2016; Murray & Zautra, 2012) and the ecological model of social environment (Bronfenbrenner, 2000). Human beings are social beings who live within communities and are shaped by their communities. Beyond individual resilience, community resilience may have important roles in understanding how people in different cultural contexts respond to adversity (Murray & Zautra, 2012). In this research, community economic resilience was defined as the financial or economic capacity of a community to recover effectively from disaster. The results of this research showed that community economic resilience might contribute to

the confidence of disaster survivors in disaster recovery and to positive attitudes toward life, accordingly helping reduce the depression among survivors. Another possible explanation for the relationship between community economic resilience and depression among survivors was that an economically resilient community provided better transportation and other public facilities that facilitated the survivors' social interaction and social network or support that subsequently decreased the depression levels of the survivors. Many studies (e.g. Huang & Wong, 2014; Li et al., 2011) have indicated that social network or support was significantly associated with depression among disaster survivors. Furthermore, survivors in an economically resilient community were less likely impacted by the earthquake and accordingly reported lower depression. The correlation analysis presented in Table 2 shows that all five earthquake impact variables were negatively and significantly associated with community economic resilience.

The moderating effect of community economic resilience on the relationship between the impact of the Yaan earthquake on income and depression expanded our understanding of the relationship between community resilience and depression among earthquake survivors. The impact of the Yaan earthquake on income tended to be more saliently and inversely related to depression among survivors who reported higher community economic resilience. As discussed earlier, community economic resilience was likely positively related to a community's efforts to prepare for disasters. Survivors who reported higher community economic resilience might have higher expectations of their community's capacities to prevent the negative impact of disasters. However, the impact of disaster might damage their expectations and lead to more salient depression among survivors. It was also possible that earthquake survivors who reported higher community economic resilience had more economic or financial resources and were more confident about their own capacities to deal with adversity. The impact of the earthquake on income might damage their confidence to a greater extent and thus lead to more salient depression. Nonetheless, more studies are warranted to examine the mechanisms that underlie the relationship between community economic resilience and depression, as well as the moderating effect of community economic resilience on the relationship between disaster impact and mental health among disaster survivors.

This study found that personal resilience did not moderate the relationship between disaster impact and depression. Personal resilience was likely insufficient to help survivors recover from the depression associated with the impacts of such a large-scale earthquake. As indicated by the results of the regression analysis shown in Table 3, among the five earthquake impact variables, only earthquake impact on income was significantly associated with depression. The results of correlation analysis shown in Table 2 also demonstrated that earthquake impact on income was positively and significantly correlated with financial strain. Earthquake impact on income and associated financial strain might contribute to the survivors' poverty, powerlessness, and isolation from the community. Adjusting to the impact of the earthquake on their income might be beyond the survivors' personal resilience.

The significant association between personal resilience and depression was in line with that reported by previous studies in other countries (e.g. Kukihara et al., 2014; Siddiqui, 2005) and confirmed that personal resilience was a crucial buffer against depression among disaster survivors in China. Resilient survivors were more psychosocially able to adapt to and recover from disaster and other stresses. They might be more open to and handle life challenges in more effective and positive ways. Therefore, the more resilient the disaster survivor, the more positive their life perspective, and accordingly the lower degree of depression they reported. Resilient survivors also possibly recovered more quickly from the earthquake. Unlike other survivors who might still be recovering when the data for this research were collected, resilient survivors might have already recovered and thus reported lower depression.

Among the five earthquake impact variables, only earthquake impact on income was significantly associated with depression. This result was different from that reported by Huang and Wong (2014). They reported that among the same five variables, only threat to life was significantly associated with depression among the survivors of the 2008 Wenchuan earthquake. The difference in the severity of the 2008 Wenchuan earthquake and the 2013 Yaan earthquake might have led the survivors to evaluate earthquake impact differently. The Wenchuan earthquake measured 8.0 on the Richter scale and caused 69,226 known deaths and resulted in 17,923 missing and 374,643 injured people in Sichuan and its surrounding areas (State Council, 2008). In such a severe earthquake, survival might be the priority and most important issue of survivors. Therefore, threat to life in the earthquake was associated with depression among the Wenchuan earthquake survivors. The Yaan earthquake was considerably less severe than the Wenchuan earthquake. Therefore, the survivors of the 2013 Yaan earthquake likely prioritized the effects of the earthquake on their income, not survival. Thus, earthquake impact on income was significantly associated with depression among the Yaan earthquake survivors.

Among the control variables, age was negatively associated with depression and financial strain was positively associated with depression, echoing similar results in the research on the survivors of the 2008 Wenchuan earthquake (Huang, Wong, & Tan, 2014; Xu & He, 2012). Older survivors likely had more life experiences and coping strategies for adversities and thus reported lower depression. Given that finance is a basic concern in people's lives, financial strain was unsurprisingly positively associated with depression. Female survivors reported higher depression because they might bear heavier burdens in caring for family members who were likely to have mental health problems after the earthquake. Consistent with other studies (e.g. Segel-Karpas, 2015), self-perceived health was negatively associated with depression. Healthier individuals would have more energy to handle life challenges and thus reported lower depression.

### *Implications*

The findings of this research have several implications. First, the association between community economic resilience and depression and the moderating

effect of community economic resilience on the relationship between disaster impacts and depression imply the importance to take into account the impacts of community factors on mental health among disaster survivors. It is likely that promoting community resilience would contribute to buffering disaster survivors' depression. Social workers and other professionals working with disaster survivors may promote community capacities for disaster prevention, mitigation, recovery and develop a more effective disaster management system, such as preparing for potential risks through insurance and building more disaster-resistant homes, roads, and other facilities to maintain a high level of preparedness. Other research (e.g. Wong, Huang, Fu, & Zhang, 2018) also suggested that social workers may promote community resilience by strengthening different types of social capital such as sense of community, social connectedness, and trust to mitigate the impacts of disaster on survivors' mental health. Second, the significant association between personal resilience and depression suggests that strategies may be adopted to facilitate disaster survivors' resilience to reduce their depression. Social workers and other professionals may encourage or cultivate disaster survivors to develop or hold positive attitudes toward adversities. Third, the negative associations between depression and both age and self-perceived health imply that older survivors may be encouraged to help younger survivors cope with disaster impacts and that physical exercise may be effective to reduce disaster survivors' depression. Social group work with disaster survivors to help them broaden social network and develop better relationship with others in the community and participate in more activities, such as organizing recreational activity groups among disaster survivors illustrated by Huang and Wong (2013), may be a good way to promote self-help among younger and older survivors, improve their health, and accordingly buffer their depression. Research also indicated that physical exercise can be buffer against depression (Eriksson & Gard, 2011).

### *Limitations*

This research has some limitations. First, the participants were recruited from four earthquake-affected towns. Moreover, the sample was small and was not randomly selected. Therefore, the generalizability of the findings is limited. Future studies may apply random sampling and include research participants from additional areas. Second, this study was cross-sectional and prohibited establishing conclusions on the directionality of relationships. Future studies with a qualitative or a longitudinal design with repeated surveys may help establish causal relationships. Third, this research applied a self-reported measure that might reflect reporting biases or personal bias, such as biases related to social desirability. Future studies with other measures may be conducted. Fourth, the scale of community economic resilience only focused on income and financial recovery and the recovery of shopping facilities, roads, and other facilities. Community resilience is a contested term which requires further empirical and conceptual work to refine and operationalize (Case, 2017). The scale to measure community economic resilience may also need

to include other elements. Future studies may expand the current scale of community economic resilience and include more items to develop a more comprehensive scale to examine its relationship with mental health among disaster survivors. Fifth, this study only examined disaster survivors' depression. However, research indicated that women are more likely to experience depression (Nolen-Hoeksema, 2001). To develop a better understanding of disaster survivors' mental health, further research may include anxiety, substance abuse, PTSDs, and other mental health elements. Despite its limitations, this research is pioneering in nature given that no research has previously examined the relationship between community economic resilience and mental health, as well as the moderating effects of personal resilience and community economic resilience on the relationship between disaster impact and mental health among disaster survivors.

## Conclusion

In conclusion, this research indicated that personal resilience and community economic resilience were negatively associated with depression among the Yaan earthquake survivors. The relationship between earthquake impact on income and depression was also moderated by community economic resilience. The research expanded our understanding about the factors associated with disaster survivors' mental health. It suggested the importance of fostering both personal and community economic resilience to reduce disaster survivors' depression.

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## Ethics

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## ORCID iD

Yunong Huang  <https://orcid.org/0000-0002-5906-8849>

## References

- Bleich, A., Gelkopf, M., Melamed, Y., & Solomon, Z. (2006). Mental health and resiliency following 44 months of terrorism: A survey of an Israeli national representative sample. *BMC Medicine*, 4, 21. doi:10.1186/1741-7015-4-21

- Bonanno, G. A., Galea, S., Bucciarelli, A., & Vlahov, D. (2006). Psychological resilience after disaster: New York City in the aftermath of the September 11th terrorist attack. *Psychological Science, 17*, 181–186. doi:10.1111/j.1467-9280.2006.01682.x
- Bronfenbrenner, U. (2000). Ecological systems theory. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (pp. 129–133). New York: Oxford University Press.
- Brown, D. D., & Kulig, J. C. (1996). The concepts of resiliency: Theoretical lessons from community research. *Health and Canadian Society, 4*(1), 29–50.
- Case, R. A. (2017). Eco-social work and community resilience: Insights from water activism in Canada. *Journal of Social Work, 17*, 391–412. doi:10.1177/1468017316644695
- Cheng, S. T., & Chan, A. C. (2005). The center for epidemiological studies depression scale in older Chinese: Thresholds for long and short forms. *International Journal of Geriatric Psychiatry, 20*, 465–470. doi:10.1002/gps.1314
- China Earthquake Administration. (2013, April 24). Sichuan Lushan 4.20 7.0 ji qianlie dizhen yi zaocheng 196 ren siwan [196 deaths in Sichuan Lushan 7.0 magnitude earthquake]. Retrieved from <http://www.cea.gov.cn/publish/dizhenj/464/515/20130424151126102109913/index.html>
- Chou, K. L., & Chi, I. (2002). Financial strain and life satisfaction in Hong Kong elderly Chinese: Moderating effect of life management strategies including selection, optimization, and compensation. *Aging & Mental Health, 6*, 172–177. doi:10.1080/13607860220126781
- Chui, C. H., Ran, M. S., Li, R. H., Fan, M., Zhang, Z., Li, Y. H., . . . Fang, D. Z. (2017). Predictive factors of depression symptoms among adolescents in the 18-month follow-up after Wenchuan earthquake in China. *Journal of Mental Health, 26*, 36–42. doi:10.1080/09638237.2016.1276542
- Cox, R., & Perry, L. (2011). Like a fish out of water: Reconsidering disaster recovery and the role of place and social capital in community disaster resilience. *American Journal of Community Psychology, 48*, 395–411. doi:10.1007/s10464-011-9427-0
- Eriksson, S., & Gard, G. (2011). Physical exercise and depression. *Physical Therapy Reviews, 16*, 261–268. doi:10.1179/1743288X11Y.0000000026
- Eshel, Y., Kimhi, S., & Goroshit, M. (2014). Post-traumatic recovery to distress symptoms ratio mediates relations of resilience fostering resources and their predictors. *Stress and Health, 32*, 216–233. doi:10.1002/smi.2594
- Fu, C., Leoutsakos, J. M., & Underwood, C. (2013). Moderating effects of a postdisaster intervention on risk and resilience factors associated with posttraumatic stress disorder in Chinese children. *Journal of Traumatic Stress, 26*, 663–670. doi:10.1002/jts.21871
- Goode, N., Salmon, P. M., Spencer, C., McArdle, D., & Archer, F. (2017). Defining disaster resilience: Comparisons from key stakeholders involved in emergency management in Victoria, Australia. *Disasters, 41*, 171–193. doi:10.1111/disa.12189
- Hickle, K. E. (2017). Resiliency and women exiting sex trade industry work. *Journal of Social Work, 17*, 302–323. doi:10.1177/1468017316644692
- Huang, Y. N., & Wong, H. (2013). Effects of social group work with survivors of 5.12 Wenchuan Earthquake in a transitional community. *Health & Social Care in the Community, 21*, 327–337. doi:10.1111/hsc.12022
- Huang, Y. N., & Wong, H. (2014). Impacts of sense of community and satisfaction with governmental recovery on psychological status of the Wenchuan earthquake survivors. *Social Indicators Research, 117*, 424–436. doi:10.1007/s11205-013-0354-3
- Huang, Y. N., Wong, H., & Tan, N. T. (2014). Associations among Chinese cultural beliefs of adversity, income recovery and psychological status of Wenchuan Earthquake survivors. *Social Work in Mental Health, 12*, 343–364. doi:10.1080/15332985.2014.889061

- Kukihara, H., Yamawaki, N., & Uchiyama, K. (2014). Trauma, depression, and resilience of earthquake/tsunami/nuclear disaster survivors of Hirono, Fukushima, Japan. *Psychiatry and Clinical Neurosciences*, *68*, 524–533. doi:10.1111/pcn.12159
- Li, Y. W., Sun, F., He, X. S., & Chan, K. S. (2011). Sense of community and depression symptoms among older earthquake survivors following the 2008 earthquake in Chengdu, Sichuan, China. *Journal of Community Psychology*, *39*, 776–785. doi:10.1002/jcop.20469
- Lueger-Schuster, B., Weindl, D., Kantor, V., Knefel, M., Glück, T., Moy, Y., . . . Jagsch, R. (2014). Resilience and mental health in adult survivors of child abuse associated with the institution of the Austrian Catholic Church. *Journal of Traumatic Stress*, *27*, 568–575. doi:10.1002/jts.21958
- Mak, W. W., Cheung, R. Y., & Law, L. S. (2009). Sense of community in Hong Kong: Relations with community-level characteristics and residents' well-being. *American Journal of Community Psychology*, *44*, 80–92. doi:10.1007/s10464-009-9242-z
- Miley, K. K., O'Melia, M. W., & DuBois, B. L. (2016). *Generalist social work practice: An empowering approach* (8th ed.). New York: Pearson.
- Moscardino, U., Scrimin, S., Capello, F., & Altoè, G. (2010). Social support, sense of community, collectivistic values, and depressive symptoms in adolescent survivors of the 2004 Beslan terrorist attack. *Social Science & Medicine*, *70*, 27–34. doi:10.1016/j.socscimed.2009.09.035
- Murray, K., & Zautra, A. (2012). Community resilience: Fostering recovery, sustainability, and growth. In M. Ungar (Ed.), *The social ecology of resilience: A handbook of theory and practice* (pp. 337–346). New York: Springer.
- Nolen-Hoeksema, S. (2001). Gender differences in depression. *Current Directions in Psychological Science*, *10*, 173–176. doi:10.1111/1467-8721.00142
- Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, *41*, 127–150. doi:10.1007/s10464-007-9156-6
- Paton, D., & Johnston, D. (2001). Disasters and communities: Vulnerability, resilience and preparedness. *Disaster Prevention and Management: An International Journal*, *10*, 270–277. doi:10.1108/EUM0000000005930
- Ponce-Garcia, E., Madewell, A. N., & Brown, M. E. (2016). Resilience in men and women experiencing sexual assault or traumatic stress: Validation and replication of the scale of protective factors. *Journal of Traumatic Stress*, *29*, 537–545. doi:10.1002/jts.22148
- Prezza, M., Amici, M., Roberti, T., & Tedeschi, G. (2001). Sense of community referred to the whole town: Its relations with neighboring, loneliness, life satisfaction, and area of residence. *Journal of Community Psychology*, *29*, 29–52. doi:10.1002/1520-6629(200101)29:1<29::AID-JCOP3>3.0.CO;2-C
- Rajkumar, A. P., Premkumar, T. S., & Tharyan, P. (2008). Coping with the Asian tsunami: Perspectives from Tamil Nadu, India on the determinants of resilience in the face of adversity. *Social Science & Medicine*, *67*, 844–853. doi:10.1016/j.socscimed.2008.05.014
- Segel-Karpas, D. (2015). Number of illnesses, self-perceived health, and depressive symptoms: The moderating role of employment in older adulthood and old age. *Work, Aging and Retirement*, *1*, 382–392. doi:10.1093/workar/wav009
- Siddiqui, R. (2005). *Response to recurring flood hazards: Appraisal and coping strategies* (Unpublished doctoral dissertation), University of Allahabad, India.



- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The Brief Resilience Scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine, 15*, 194–200. doi:10.1080/10705500802222972
- State Council. (2008). Guowuyuan yuanyu yinfa Wenchuan dizhen zaihou huifu chongjian zongti guihua de tongzhi [The notice of print and distribution of the overall planning of post-Wenchuan earthquake recovery by the State Council]. Retrieved from [http://www.gov.cn/zwgk/2008-09/23/content\\_1103686.htm](http://www.gov.cn/zwgk/2008-09/23/content_1103686.htm)
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson.
- Walsh, F. (2007). Traumatic loss and major disasters: Strengthening family and community resilience. *Family Process, 46*, 207–227. doi:10.1111/j.1545-5300.2007.00205.x
- Wandersman, A., & Nation, M. (1998). Urban neighborhoods and mental health: Psychological contributions to understanding toxicity, resilience, and interventions. *American Psychologist, 53*, 647–656. doi:10.1037/0003-066X.53.6.647
- Wong, H. (2009). *Funv jiuye yu jingshen jiankang diaocha baogao [Report on the investigation of women's employment and mental health]*. Hong Kong: Hong Kong Federation of Women's Centres.
- Wong, H., Huang, Y. N., Fu, Y., & Zhang, Y. (2018). Impacts of structural social capital and cognitive social capital on the psychological status of survivors of the Yaan earthquake. *Applied Research in Quality of Life*. Advance online publication. doi:10.1007/s11482-018-9661-9
- Xie, Z., Xu, J., & Wu, Z. (2017). Mental health problems among survivors in hard-hit areas of the 5.12 Wenchuan and 4.20 Lushan Earthquakes. *Journal of Mental Health, 26*, 43–49. doi:10.1080/09638237.2016.1276525
- Xu, J., & He, Y. (2012). Psychological health and coping strategy among survivors in the year following the 2008 Wenchuan Earthquake. *Psychiatry and Clinical Neurosciences, 66*, 210–219. doi:10.1111/j.1440-1819.2012.02331.x