

Why People Don't Prepare for Disasters? A National Survey from China

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Key Points:

- The adoption of preparedness actions decreases from material preparedness to awareness preparedness and then to participation preparedness.
- The top three reasons for not preparing are "not aware," "do not know where to buy or where to reach," and "the action is not useful. "
- Trust in government, relocated, urban area, and socioeconomic status are positively correlated with all the seven preparedness activities.

(The above elements should be on a title page)

43

44 **Abstract**

45 Preparedness is important for reducing potential losses from various disasters. There are limited
46 studies that investigated the concrete reasons for not adopting a specific preparedness action.
47 This paper fills such a gap using representative national survey data from China. Seven disaster
48 preparedness actions, namely "preparing food and water at home," "pay attention to disaster-
49 related information," "making emergency plans," "being aware of nearest shelters," "being aware
50 of building code," "participating in exercise or drills" and "being a volunteer for emergencies"
51 are used as the measure of preparedness behaviors. Overall, the public has adopted more
52 material-related preparedness actions, equipped with fewer awareness activities, and had the
53 least community participation-related preparedness behaviors. The primary reasons for not
54 adopting these actions are "not aware," "don't know where to buy or where to reach," and "the
55 action is not useful, there is no necessary," while "costly," "need special knowledge," "don't have
56 time," "need collaboration with others," "energy-consuming" and "not my responsibility" are the
57 less chose reasons. Besides, trust in government, relocation due to disasters, living in urban
58 areas, and a higher degree of socioeconomic status are positively correlated with higher
59 probabilities of adopting all the seven preparedness activities. These findings highlight the
60 importance of community outreach from emergency management professionals to increase the
61 public's awareness of preparing for potential disasters. It is necessary to let the general public
62 know the existence of these preparedness actions, and these actions can reduce losses.

63

64 **Plain Language Abstract**

65 Preparation for disasters can save lives and potential economic losses. This paper surveys the
66 public's preparation behaviors in China. For those who did not adopt these disaster preparedness
67 actions, the primary reasons are that they do not become aware of the existence of these actions
68 and do not know where to reach these activities, and the third one is that they don't think these
69 preparedness actions are helpful during emergencies. Other barriers such as money, time,
70 collaboration efforts are not the primary reasons for not adopting these actions. This paper
71 highlights the importance of disaster education for the public.

72

73 **1 Introduction**

74 Natural-induced disasters claim hundreds of lives and millions of economic losses
 75 worldwide each year. According to the United Nations Disaster Risk Reduction report and the
 76 Davos World Risk Forum' report, there is an increasing trend of threats from various risks
 77 worldwide, especially in the context of climate change (UNDRR, 2020b; World Economic
 78 Forum, 2020). Pre-disaster mitigation and preparedness can reduce the disaster impact. For
 79 example, calculations from the United States demonstrated that a one-dollar pre-disaster
 80 mitigation investment could reduce 6-dollar losses from potential disasters (Gall & Friedland,
 81 2020). Therefore, it is essential to discover the facilitators and barriers of pre-disaster mitigation
 82 and preparedness to reduce potential disaster losses in the uncertain world.

83 There are two ways to conceptualize the contents of preparedness in current disaster
 84 research and practice. One way is to see preparedness as an overall conceptualization covering
 85 all the mitigation, prevention, protection, response, and recovery activities, which is proposed as
 86 the disaster preparedness framework by the Federal Emergency Management Agency of the
 87 United States (FEMA, 2016). Another traditional and widely accepted conceptualization of
 88 disaster preparedness is that it involves the knowledge and capacities developed by all
 89 stakeholders within a community before a disaster occurred, and developing an emergency plan,
 90 learning knowledge of risk and protective actions, doing exercise or drills are the commonly
 91 known activities (UNDRR, 2020a). Since disaster preparedness needs to engage all stakeholders
 92 within communities, and the households, in particular, should be at the core of efforts to promote
 93 disaster preparedness activities.

94 Most of the current disaster preparedness studies at the household level follow the social-
 95 psychological paradigm, and survey is the predominant method (Bird, 2009; Paton, 2003, 2019;
 96 Rostami-Moez et al., 2020; van Valkengoed & Steg, 2019). Examples of disaster preparedness
 97 activities within a household can be material preparedness such as preparing emergency kits,
 98 food, or water; awareness preparedness, such as learning disaster-related knowledge, or
 99 behavioral preparedness such as participating in drills or being a volunteer of community
 100 emergency response team (Han, Wang, et al., 2017; Lindell et al., 2009; Wu et al., 2018). The
 101 Protective Action Decision Model (PADM), Health Belief Model (HBM), Social Cognitive
 102 Model (SCM), and Theory of Planned Behavior (ToPB) are the widely used theoretical
 103 frameworks to investigate the determinants of household preparedness (Ejeta et al., 2015; Lindell
 104 & Perry, 2012). The cognitive process, such as risk perception, responsibility attribution, and
 105 trust in key stakeholders, and socioeconomic status differences, are the influencing factors
 106 included in empirical studies (Bubeck et al., 2012; Han, Lu, et al., 2017; Wehde & Nowlin,
 107 2021).

108 The influencing factors of individual and household preparedness behaviors can be
 109 understood from four clusters (Kohn et al., 2012; Levac et al., 2012; Lindell & Perry, 2012;
 110 Ryan et al., 2020). The first group of variables related to the socioeconomic and demographic
 111 characteristics of the respondents and households. These factors can be income, education,
 112 gender differences, having dependents like a child(ren) or disabled family members, etc. (Adams
 113 et al., 2019; Eisenman et al., 2009). For example, females usually have a higher risk perception
 114 but a relatively lower preparedness degree than males (Wachinger et al., 2013). The second

cluster is about the hazards and contextual factors, such as environmental cues and the related psychological feelings like the place attachment and the disaster experience. The mental model or the psychological antecedents of behavior (Carman & Zint, 2020; Lindell & Perry, 2012; van Valkengoed & Steg, 2019) are the third clusters of influencing factors, which can determine an individual's comprehension of potential hazards, and then link these comprehensions to the decision-making process. These factors include risk perception, efficacy perception, trust, and responsibility attribution among stakeholders, etc. The last bunch of factors is the barriers and facilitators, which may prevent or encourage the decision-making of preparedness from intentions to actual actions (Lindell & Perry, 2012; Ryan et al., 2020). Practice-oriented or action researchers have investigated various ways of promoting the public's engagement in disaster preparedness activities (Eisenman et al., 2018; Ryan et al., 2020). Within these factors, the barriers that prevent the preparedness intentions to actual actions are the least investigated, but these factors are crucial from the implementation perspective.

Therefore, employing a recent national survey from China, we tried to answer the questions of why the public does not adopt a specific preparedness action that may reduce the potential disaster impact in this paper. In particular, we proposed nine potential reasons (Lindell et al., 2009) for not adopting a specific preparedness action if a respondent answered "not adopted" one of the seven specific actions. Meanwhile, we also estimated the disaster experience, trust in stakeholders, and socioeconomic variances in adopting disaster preparedness activities using regression models. This paper can answer the following questions, which are rarely studied in previous literature.

(1) What are the primary reasons for not adopting specific preparedness actions such as preparing an emergency kit, being a volunteer for a community emergency response team, etc.?

(2) How the confidence in government will affect the adoption of the preparedness actions?

2 Data and Methods

2.1 Sampling and Participants

All 31 provinces in Mainland China, not including Taiwan, Hong Kong, and Macau, were included in this survey. The capital city of each province, which usually the biggest city of each province, was included, and another small city/prefecture within each province was purposively selected due to their relevance to earthquake risks. These criteria have either experienced an earthquake in history (8 prefectures), or either located in an area with high earthquake risk (9 prefectures) or included in the catastrophe risk insurance initiative program recently (3 prefectures). Within each of the cities/prefectures, 100 samples were randomly selected from an online survey service company's database. The four megacities, Beijing, Shanghai, Chongqing, and Tianjin, had doubled the number of samples.

The data collection effort was implemented from August 2017 to September 2018 through an online survey platform. Invitations were sent to 95,388 individuals through emails or phone text messages, and 10,499 responded in the first round. Then the survey questionnaires were sent to these 10,499 individuals, and 6,611 questionnaires were returned. After deleting the 81 unfinished ones, 6,530 surveys were included in the final analysis.

2.2 Measures of Variables

Disaster Preparedness: Usually, there are two ways of inquiring individual's preparation for potential disasters. One is the self-reported perception, and the question is always framed like "How do you evaluate your preparation for XXX" and the answers would be measured by a Likert scale (Han et al., 2021). An alternative way is to investigate the actual preparation behavior, and the question used is generally expressed as "Have you prepared a XXX?" and the answers would be a checklist of actual preparedness actions (Lindell et al., 2009; Wu et al., 2018). Based on these studies inquired the actual preparedness actions, we inquired the respondents' seven preparedness behaviors in this survey, and they were about (1) preparing unique materials for emergencies, (2) paying attention to disaster-related information, (3) preparing a written family emergency plan, (4) be aware of nearest emergency shelters, (5) be aware of the building code for seismic risk of the region, (6) participated in emergency-related training or drills, and (7) being a volunteer for emergency-related activities. The first one is material preparedness action, the last two are community participation-related activities, while the rest are awareness preparedness actions. The answers to all the seven questions were "yes (1)" or "no (0)". The aggregation of all the seven preparedness actions was used as the measure of preparedness in the analysis, and thus the preparedness indicator ranged from one to seven, with a mean value of 5.09 and a standard deviation of 2.23 (Table 1).

If a respondent chose "no," we inquired why not adopting that specific preparedness actions in detail, which is developed based on previous studies (Lindell et al., 2009). The question was, "Can you tell us the primary reason that you did not adopt this action, please" and we proposed nine potential reasons with another one as others to let the respondent fulfill in text. The ten proposed reasons were (1) too costly, have no money, (2) needs lots knowledge or technology, (3) time consuming, (4) cannot finish by oneself, need collaboration with others, (5) too energy-consuming, (6) not aware, (7) the action has limited function, no necessary, (8) don't know where to buy or to prepare, (9) taking this action is not my responsibility, (10) others.

Controlled variables: Based on prior studies on disaster preparedness (Lindell & Perry, 2000; Sattler et al., 2000), we included the gender (male=1), age group, ethnicity status (ethnicity=1), education attainment, marriage status (married=1), whether have a child(ren) at home (yes=1), whether have elders at home (yes=1), urban and rural differences (rural=1), self-reported socioeconomic status, disaster experience, and trust in government as the controlled variables in this study. The disaster experience had three measures, and the first one was the experience of a natural-induced disaster, such as an earthquake, a landslide, or a flood. The second one was the pandemic experience such as H1N1, H1N5, and the third was whether they had been relocated due to disasters. The trust in government captured the degrees of trust in five levels of government in China, namely the central government, the provincial government, the county government, the township government, and the village/community self-governance committee. The question was "how do you trust the following institutions," and the answers to each ranged from one to five, representing the meaning from "not trust at all" to "trust very much." The sum of the trust degrees to all the five levels of government was used as the degree of trust in government, ranging from five to twenty-five, and the Cronbach's alpha test result of the five variables was 0.8570, indicating good internal reliability. The self-reported socioeconomic status ranking from one to five was captured by the question, "how do you evaluate your socioeconomic ranking in the region where you live now, from the lowest to highest?"

2.3 Data Analysis Strategy

We employed multilevel regressions for modeling in this analysis. We first reported the descriptive analysis of the preparedness activities and the influencing factors in Table 1, and then we reported the inquired reasons for not prepared in Figure 1. The overall preparedness degree was the aggregation of the adoption of the seven specific preparedness activities, and thus we employed a two-level linear regression model with the control of province differences, and the results were reported in Figure 2. Moreover, we employed the two-level logistic regressions to estimate the effects of the predicting variables on the seven specific preparedness actions, respectively, and the results were reported in Table 2. All the data analysis was implemented by statistical software Stata 16.0.

3 Results

3.1 Descriptive analysis

As shown in Table 1, 59.95% of the respondents were male, 40.03% were under 30, 59% were between 30 and 60, while only 0.96% were older than 60. 7.14% were the minority, 79.10% were married, 20.47% had a child(ren) at home, 24.61% had elders within the home, and 14.24% were from rural areas. Regarding educational attainment, 0.63% were primary school-educated or illiterate, 3.86% were middle school educated, 18.21% attained high school, 72.54% attained college, and 4.76% had a post-graduate education degree. The average value of self-reported socioeconomic status was 2.91 with a standard deviation of 0.77 and a range between one to five. In terms of disaster experience, 14.75% of the participants had experience of natural-induced disasters, such as floods, earthquakes, or landslides. 7.12% of them had the experience of H1N1 or H1N5 flu, and 14.75% of them had been relocated due to disasters. The overall degree of trust in government was 19.88, with a range between five to twenty-five.

For the seven types of disaster preparedness activities, 90.84% of the respondents said that they would pay special attention to disaster-related information during regular days, 76.60% indicated that they had prepared foods and waters that can last about three days at home, 72.22% said they had an emergency plan within family members, 75.53% knew the nearest emergency shelters, while 73.75% knew the building code requirement for a potential earthquake in their region, 66.26% had participated in a community exercise or drill while 54.10% reported a volunteer experience.

[Table 1 Here]

3.2 Barriers of preparedness

We inquired the reasons for not adopting a specific preparedness action when the respondents chose "No," and we proposed nine options with an additional open question as others. The primary dominated reasons were "I am not aware (of doing this for potential disasters)," "I don't know where to buy or to learn or to reach," and "I don't think it's useful or necessary" (Figure 1). For the material preparedness and "paying attention to disaster-related information," the top three reasons for not preparing were "not aware," "not useful," and "don't know where to buy or to reach." The top three reasons for "not making an emergency plan" were "not aware," "don't know where to learn," and "not my responsibility." For the "knowing the building code," the top three reasons for not adopting were "don't know where to reach," "not aware," and "need too much technical knowledge," while the top three reasons for not aware of

the shelter were "don't know where to learn," "not aware" and "not useful." For the two participation preparedness activities, in terms of volunteering and training, the primary reason for not adopting was "don't know where to each," while the "not aware," "time-consuming," "need collaboration efforts," and "energy-consuming" had similar distributions.

[Figure 1 Here]

We used the aggregation of the adoption of the seven disaster preparedness activities as the overall degree of disaster preparedness and a two-level multilevel linear regression model to estimate the effects of socioeconomic variables, disaster experience, and trust in government on the overall preparedness. As shown in Figure 2, being a male, being a minority, being married, and having a higher degree of self-reported socioeconomic ranking would significantly report a higher degree of disaster preparedness. The elders, families with elders living in a rural area, and had natural-induced disaster experiences were negatively and significantly correlated with disaster preparedness. However, the ones with experience of relocation due to disasters would report 1.189 higher preparedness degrees than those without relocation experience. Moreover, with a higher degree of trust in government, a respondent would have a higher degree of preparedness. The educational attainment, whether have a child(ren) at home, and the experience of H1N1 were not significant predictors.

[Figure 2 Here]

We conducted seven logistic regressions to estimate the correlations between the factors mentioned above and the seven specific preparedness actions, and the results were reported in Table 2. Overall, the ones with higher socioeconomic status, the ones with relocation or reconstruction experience due to disasters, the ones with a higher degree of confidence in the government's capacity in disaster response, and the ones living in urban areas had a significantly higher likelihood of adopting all the seven preparedness actions included in this study. Family with child(ren) and pandemic experience were not significantly correlated with any seven actions. The gender, age, minority status, education, marriage, family with elders, and disaster experience had mixed correlations among these seven preparedness actions. The gender difference was not significant for the "paying attention" and "knowing the community emergency plan." The elders were less likely to have material supplies, "knowing community plan," "knowing emergency shelters," "participating in drills," or "being a volunteer." With a higher degree of education, a respondent would be more likely to "pay attention," "participating in drills," or "being a volunteer," but less likely to know community emergency plans. The married ones were more likely to adopt all the preparedness actions besides the participation in drills. Family with elders was less likely to know the emergency plan, know the shelter, know the building code, participate in drills, and work as a volunteer. Interestingly, natural-induced disaster experience was negatively correlated with knowing the emergency plan, knowing the nearest shelter, building code, and volunteering.

[Table 2 Here]

4 Conclusions

Mother nature claims human lives and economic losses each year. Pre-disaster mitigation and preparedness actions by human beings can mitigate the risk and reduce potential losses. This paper investigates the public's reasons for not preparing for potential disasters using a representative survey from China. Seven types of preparedness actions related to material

preparedness, awareness preparedness, and participation preparedness are proposed in the survey. The primary reasons for not adopting these actions are "not awarded," "don't know where to buy or where to reach," and "the action is not useful, no necessary." Besides, with a lower level of trust in government, living in rural areas, with a lower level of socioeconomic status, and those who have disaster experience but are not severely impacted have a lower probability of adopting all the seven types of preparedness behaviors. This study highlights the importance and necessity of community outreach and public education from disaster and emergency management professionals.

Acknowledgments, Samples, and Data

- The authors declare no conflict of interest with respect to the results of this paper.
- The Disaster Preparedness Survey (2018) data used for the analysis and modeling in the study are available at Mendeley Data via doi: 10.17632/r5tfjc8j2m.1 with CC BY 4.0.

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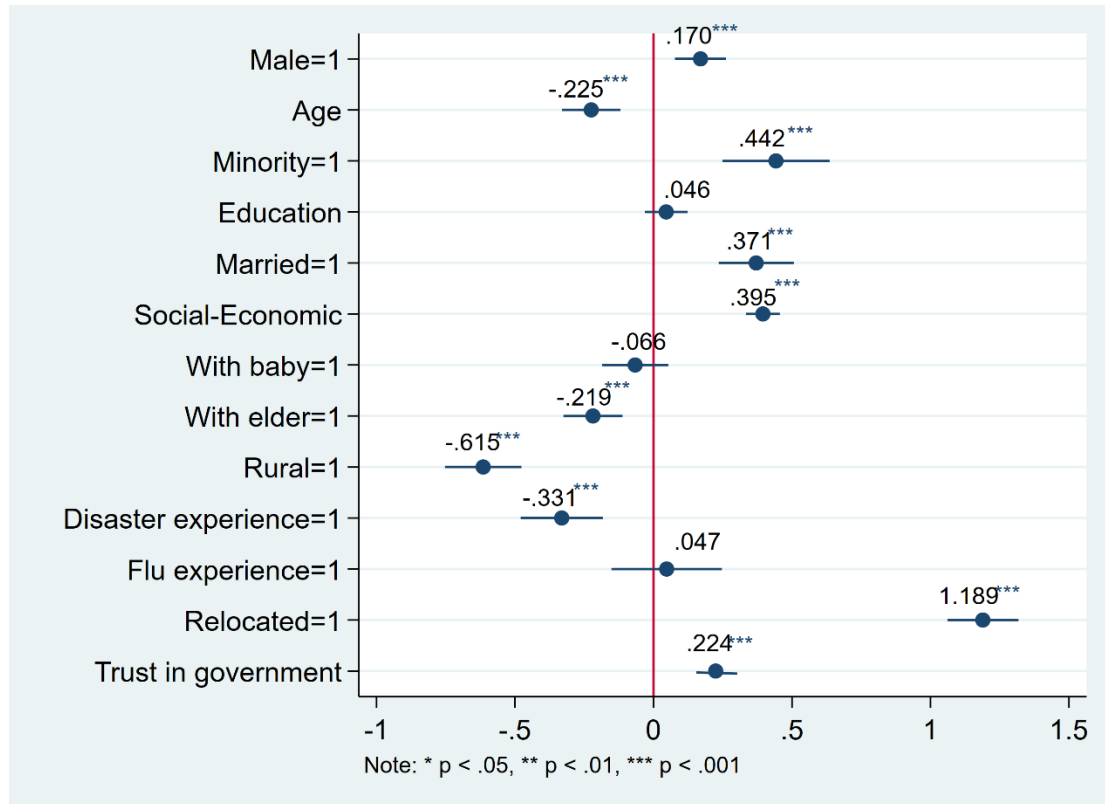
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Figure 1. Reasons for not prepared (percentage in tables)

Reasons for not adopting	Material (N=1,528)	Attention (N=598)	Plan (N=1,814)	Shelter (N=1,598)	Building code (N=1,714)	Drill (N=2,203)	Volunteer (N=2,998)
Costly	9.42	4.01	3.75	2.44	3.15	2.22	2.13
Need knowledge	2.03	4.52	3.91	1.88	12.19	2.63	5.97
Don't have time	4.19	8.03	3.91	3.44	3.03	9.03	9.91
Need collaboration	2.68	7.19	8.82	4.94	5.78	10.44	7.20
Energy consuming	4.45	5.52	6.28	3.00	2.80	9.80	14.94
Not aware	44.83	38.46	33.74	35.61	28.24	13.98	13.41
No necessary	20.68	18.56	9.21	5.57	3.68	5.04	6.37
Don't know where to find	9.75	9.36	16.81	36.92	32.85	40.26	35.92
Not my responsibility	1.37	3.85	12.51	5.32	7.53	5.08	3.24
Others	0.59	0.50	1.05	0.88	0.76	1.50	0.90

Figure 2. Multilevel regression on the overall disaster preparedness degrees



405 **Table 1.** Descriptive analysis (N=6,350)

	Frequency	Percentage
Gender		
Female	2,615	40.05
Male	3,915	59.95
Age (years old)		
<30	2,614	40.03
30-60	3,853	59
>60	63	0.960
Ethnicity		
Han	6,064	92.86
Minority	466	7.140
Education		
Primary and below	41	0.630
Middle	252	3.860
High	1,189	18.21
Colleague	4,737	72.54
Graduate school	311	4.760
Marriage		
Single	1,365	20.90
Married	5,165	79.10
Child (ren)		
No	5,193	79.53
Yes	1,337	20.47
Elder (>60)		
No	4,923	75.39
Yes	1,607	24.61
Urban-rural		
Urban	5,600	85.76
Rural	930	14.24
Disaster experience		
No	5,567	85.25
Yes	963	14.75
H1N1 experience		
No	6,065	92.88
Yes	465	7.120
Relocated due to disaster		
No	5,567	85.25
Yes	963	14.75
Emergency supplies		
No	1,528	23.40
Yes	5,002	76.60
Pay attention for disaster information		
No	598	9.160

Yes	5,932	90.84
Know Emergency plan		
No	1,814	27.78
Yes	4,716	72.22
Know shelter		
No	1,598	24.47
Yes	4,932	75.53
Know building code		
No	1,714	26.25
Yes	4,816	73.75
Exercise or drill		
No	2,203	33.74
Yes	4,327	66.26
Being a volunteer		
No	2,997	45.90
Yes	3,533	54.10
	Mean(SD)	Range
Number of preparedness activities	5.09 (2.23)	0-7
Perceived socioeconomic status	2.91 (0.77)	1-5
Trust in government	19.88 (3.51)	5-25

407 **Table 2** Multilevel Logit Regression on Individual Preparedness Activities (N=6,350)

	Supply	Pay attention	Plan	Shelter	Building code	Drill	Volunteer
Gender (male=1)	1.27*** [1.11,1.45]	1.03 [0.85,1.24]	1.13 [0.99,1.29]	1.29*** [1.13,1.47]	1.22** [1.07,1.39]	1.13* [1.00,1.28]	1.22** [1.08,1.37]
Age group	0.81** [0.69,0.95]	1.10 [0.89,1.37]	0.63*** [0.54,0.74]	0.90 [0.77,1.05]	0.86 [0.74,1.01]	0.75*** [0.65,0.86]	0.77*** [0.67,0.88]
Minority (minority=1)	1.62** [1.17,2.23]	1.24 [0.82,1.87]	2.31*** [1.66,3.20]	1.58** [1.16,2.16]	1.69*** [1.24,2.31]	1.73*** [1.30,2.31]	1.65*** [1.27,2.15]
Education	1.05 [0.94,1.18]	1.26** [1.09,1.45]	0.89* [0.80,0.99]	0.94 [0.85,1.05]	0.99 [0.89,1.11]	1.17** [1.06,1.29]	1.11* [1.00,1.23]
Marriage (married=1)	1.42*** [1.17,1.71]	1.43** [1.12,1.83]	1.52*** [1.26,1.84]	1.55*** [1.29,1.86]	1.36* [1.13,1.65]	1.10 [0.92,1.31]	1.47*** [1.23,1.75]
Socioeconomic	1.57*** [1.43,1.71]	1.55*** [1.37,1.74]	1.43*** [1.31,1.56]	1.34*** [1.23,1.46]	1.75*** [1.60,1.91]	1.22*** [1.13,1.33]	1.28*** [1.18,1.39]
Family with child(ren)	1.11 [0.93,1.33]	1.05 [0.82,1.35]	1.06 [0.89,1.26]	0.86 [0.72,1.01]	0.88 [0.74,1.04]	0.88 [0.75,1.03]	0.89 [0.76,1.04]
Family with elders	0.87 [0.75,1.01]	1.08 [0.88,1.33]	0.79** [0.69,0.92]	0.86* [0.74,1.00]	0.74*** [0.64,0.86]	0.86* [0.75,0.98]	0.78*** [0.68,0.90]
Rural (rural=1)	0.62*** [0.51,0.74]	0.64*** [0.50,0.82]	0.72*** [0.60,0.87]	0.58*** [0.48,0.70]	0.45*** [0.38,0.55]	0.68*** [0.57,0.81]	0.52*** [0.43,0.62]
Disaster experience	0.89 [0.73,1.08]	1.26 [0.95,1.67]	0.79* [0.65,0.96]	0.71*** [0.59,0.87]	0.57*** [0.47,0.69]	0.91 [0.75,1.10]	0.54*** [0.44,0.65]
H1N1 experience	0.92 [0.71,1.20]	1.06 [0.73,1.55]	1.07 [0.82,1.39]	1.13 [0.87,1.47]	1.03 [0.79,1.33]	0.90 [0.70,1.15]	1.04 [0.80,1.35]
Relocated (relocated=1)	4.10*** [3.17,5.29]	2.17*** [1.57,3.00]	5.07*** [3.95,6.51]	3.69*** [2.90,4.68]	3.35*** [2.66,4.21]	3.92*** [3.18,4.83]	5.64*** [4.64,6.86]
Confidence in government	1.20*** [1.18,1.23]	1.17*** [1.14,1.20]	1.24*** [1.21,1.26]	1.20*** [1.18,1.23]	1.22*** [1.19,1.24]	1.23*** [1.21,1.26]	1.20*** [1.18,1.23]

408 Note: Odds ratios were reported; 95% confidence intervals in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; the provinces were
409 controlled as analysis unit.
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