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The Impact of Preserving Social Connections on Recovery and Reconstruction in Communities Affected by Natural Disasters

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ABSTRACT

To improve disaster resilience of older adults, it is increasingly recognized that preserving social connections in the community—also referred to as social capital—serves as a crucial ingredient (Glass & Balfour, 2003). According to Aldrich (2012) (Aldrich, 2012), communities endowed with higher stocks of social capital—i.e., stronger bonds of trust between community members, as well as norms of mutual assistance—are better equipped to cope with the devastating consequences of disasters. To quote Aldrich: "Standard advice about preparing for disasters focuses on building shelters and stockpiling things like food, water, and batteries. But resilience—the ability to recover from shocks, including natural disasters—comes from our connections to others, and not from physical infrastructure or disaster kits."

KEYWORDS

Japan; Natural disaster; Older individuals; Cognitive decline; Multiple, Membership model; Natural experiment; Community-level social capital.

1. Introduction

Natural disasters are increasing in frequency and severity worldwide, partly due to climate change but also due to increasing human settlement in disaster-prone areas (Center for Research on the Epidemiology of Disasters, 2017). Due to population aging, older individuals are increasingly and disproportionately affected by disasters. For example, during Hurricane Katrina people aged 60 and older comprised 15 percent of the population of disaster-affected areas. Yet 70 percent of those who died as a result of the hurricane were aged 60 or older (Benson et al., 2007). During the March 11, 2011 earthquake/tsunami that struck northeastern Japan, 56% of deaths due to the disaster occurred among older individuals aged 65 years and older (HelpAge International, 2013).

Social capital is often separated into cognitive and structural components. The former refers to how people perceive social relations in their community (e.g. trust in others, mutual help, and community attachment), while the latter component captures what people actually do (e.g., informal socializing with their neighbors and participation in social activities) (Harpham, 2008). We previously reported that informal socializing and social participation among individuals helped to prevent cognitive decline among older residents who experienced the 2011 Great East Japan Earthquake and Tsunami. Moreover, participation and informal socializing served to buffer the impacts of housing damage (and subsequent residential dislocation) on cognitive decline (Hikichi et al., 2017b).

2. Study Participants

We mailed questionnaires to every resident aged 65 years or older in August 2010 (n=8,576), using the official residential register of Iwanuma City. The survey inquired about personal characteristics, health status, as well as residents' perceptions about their community (e.g. social cohesion). The response rate was 59.0% (n = 5,058), which is comparable to other surveys of community-dwelling residents.

The earthquake and tsunami occurred on March 11, 2011, seven months after the baseline survey was completed. Iwanuma city is a coastal municipality located approximately 80 kilometers west of the earthquake epicenter, so that it was in the direct line of the tsunami. That disaster killed 180 of the town's residents, damaged 5,542 housing units and inundated 48% of the land area (Figure 1) (Miyagi Prefectural Government, 2017).

3. Explanatory Variables

Our primary exposure variables are cognitive and structural dimensions of social capital aggregated to the community (i.e. gyousei-ku) level. Our exploratory factor analysis confirmed two sub-scales for social capital – one representing the cognitive dimension ("Social cohesion") and the other representing the structural dimension ("Informal socializing & social participation") (Hikichi et al., 2017b). The cognitive dimension was assessed based on answers to questionnaire items about residents' perceptions of trust in the community, norms of mutual help, and community attachment. These were evaluated using the questions "Do you think that people living in your community can be trusted in general?" (Generalized trust); "Do you think people living in your community try to help others in most situations?" (Mutual help); and "How attached are you to the community in which you live?" (Community attachment). Responses were ordered along a 5-point Likert scale, with 1 indicating not at all and 5 indicating strong agreement.

The structural dimension of social capital was measured by the frequency of meeting with friends, the number of friends with whom the respondent met during the past month, and the frequency participating in sports and hobby clubs per week. Respondents were asked "How often do you see your friends?" (Frequency meeting with friends, 1: Rarely - 6: Almost every day); "How many friends/acquaintances have you seen over the past month? Count the same person as one, no matter how many times you have seen him/her." (Number of friends met, 1: None - 5: 10 or more); "How often do you attend sports club activities (Frequency participating in sports clubs, 1: None - 6:.

4. Statistical Analysis

In this study, we adopted a multiple membership multilevel regression model to examine the neighborhood effect of social capital on cognitive decline. The three levels specified in our model were: survey time (baseline and follow-up) at level 1 nested within individuals at level 2, nested within communities at level 3. In our sample, 171 respondents relocated to a different community during the follow-up period. A multiple membership multilevel model introduces weights to account for the duration of time that each resident spent in different communities before and after the disaster, i.e. it is a method for weighting the exposure to different communities. Our two survey waves were conducted in August 2010 and October 2013, while the disaster happened on March 11, 2011. Thus, we assigned a weight of 0.2 to membership in the pre-disaster community, and 0.8 to the post-disaster community (see also eFigure 1).

5. Results

Comparing our analytic sample with data from the local census at baseline (eTable 6), we can see that women made up 56.5% of our analytic sample, which is quite comparable to the actual Census of older residents in Iwanuma city in October, 2010 (male 42.8%, female 57.2%, $p = 0.47$) (Iwanuma City, 2010a). The age distribution of our sample is close to the local census data except for the group aged 85 years and over (respondents 6.2%, census data 13.2%, $p < .01$) (Iwanuma City, 2010a). A somewhat higher proportion of our respondents were married (71.4%) compared to the census data (64.7%, $p < .01$) (Iwanuma City, 2010b). The proportion of employed individuals in our data (17.8%) is also quite close to the census data (17.2%, $p = 0.44$) (Iwanuma City, 2010c). These comparisons support the representativeness of our data relative to Iwanuma city as a whole.

In addition, we also compared the characteristics of our analytic sample to nonrespondents at the follow-up survey (n=786). The sex distribution was similar ($p = 0.29$), although our analytic sample was somewhat older than the non-respondents ($p < .01$) (eTable 6). The proportion of married people in our analytical sample (71.4%) was higher than among non-respondents (64.9%, $p < .01$). More respondents were likely to be employed at the time of the baseline survey (17.8%) compared with non-respondents (14.0%, $p = 0.02$). Non-respondents were also less likely to be classified as functionally independent (84.1%) compared with the analytic sample (95.9%, $p < .01$). This could have resulted in some attrition bias, but the differences were not large. We also compared geographic distributions of the dropped baseline respondents and our panel respondents (eFigure 2). The densities across communities at baseline in both group showed similar ranges (0.1% to 3.6% for the analytic sample; 0.2% to 3.8% for the dropped baseline respondents). We found similar geographic distributions between both groups. This comparison suggested that non-respondents at the follow-up survey lived in the same areas as the panel respondents.

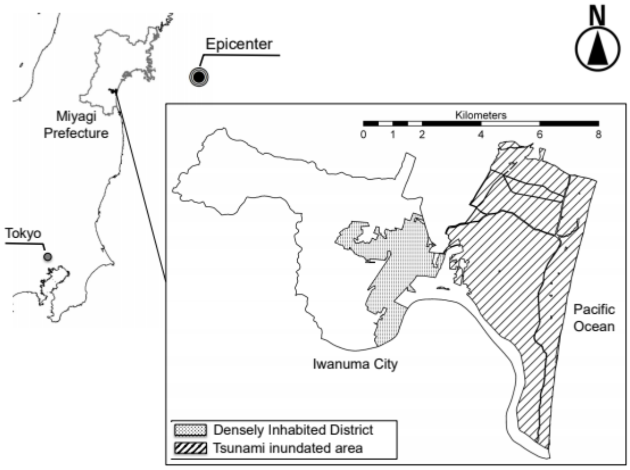

Figure 1. Map of the tsunami inundated area in Iwanuma city, Japan

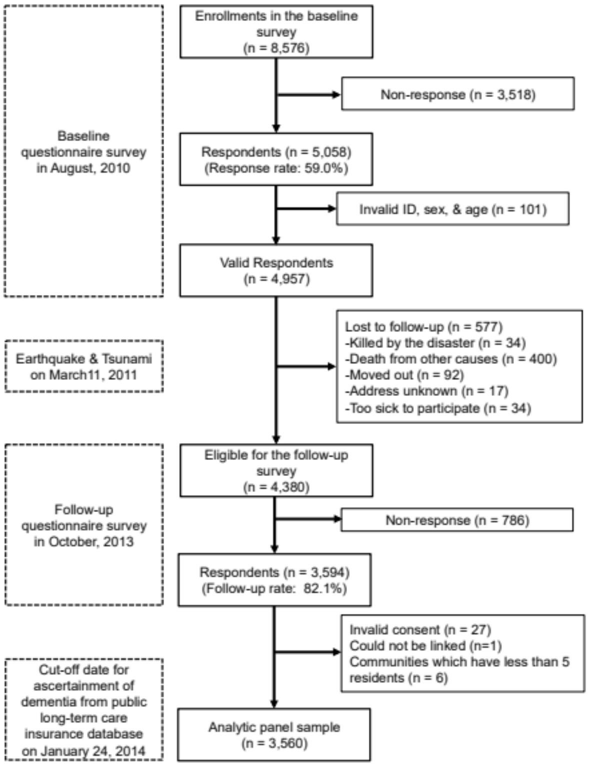

Figure 2. Participants Flow for Analytic Sample (n = 3,560)

6. Discussion and Conclusions

There are plausible reasons to explain why housing damage was associated with cognitive decline, as well as why community-level social capital buffered this association. In Iwanuma City (as in other disaster-affected areas), people whose homes were destroyed were moved into prefabricated temporary housing villages [kasetsu jutaku] resembling FEMA (Federal Emergency Management Agency)–style trailer settlements in the United States. Relocating cognitively vulnerable older individuals into unfamiliar environments may have hastened their cognitive decline (Heller, 1982). We believe that it was the residential dislocation (and the attendant social isolation) that was the underlying cause of cognitive decline – and not the psychological trauma associated with experiencing housing destruction. Our reasoning is based on the observation that other traumatic disaster-related experiences (such as loss of relatives and close friends) were not significantly correlated with cognitive decline after the disaster (coefficient = 0.01 (-0.05 to 0.03), model 2 in Table 2). Our findings of the contextual effect of informal socializing and social participation suggest that a resident who did not personally meet with friends or participate in clubs could nonetheless benefit from their communities as a result of other people participating and actively socializing with each other. After the disaster, residents who moved together with their neighbors into the prefabricated housing village continued to organize a variety of communal activities within the community (Miyagi Prefectural Government, 2013). We hypothesized that these communal activities helped to preserve the social connections and mutual support (as well as apparently mundane daily activities such as visiting with neighbors) among affected people, thereby raising community-level informal socializing and social participation. Even residents who did not have many friends in the community could have benefited from opportunities to participate in communal activities by securing social support from their neighbors. The contextual effect of community-level informal socializing and social participation helped to preserve residents' cognitive function from the impact of housing damage/relocation.

As an additional sensitivity test, we separately examined the association of each sub-dimension of social capital with cognitive decline. Only community-level informal socializing and social participation were significantly associated with lower risk of cognitive decline (main effect) as well as a buffering effect among people who suffered housing damage (cross-level interaction effect).

In conclusion, our findings suggested that the structural dimension of communitylevel social capital mitigated the impact of housing damage on cognitive decline in the aftermath of a natural disaster. Our previous study using the same cohort showed that affected individuals who were dislocated together with communities prior to the disaster reported higher informal socializing and social participation in comparison with people relocated individually (i.e. by a lottery process) because the former group were able to preserve existing social capital (Hikichi et al., 2017a). Hence the method of relocating disaster victims is likely to have an important impact on their ability to maintain community ties.

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