



Predictors of depressive symptoms following the Great East Japan earthquake: A prospective study



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ABSTRACT

We sought to investigate prospectively the association between exposure to disaster (the 2011 East Japan Earthquake) and change in depressive symptoms among community-dwelling older adult survivors. We used two waves of data from the Japan Gerontological Evaluation Study (JAGES), an ongoing population-based, prospective cohort study in Japan. A unique feature of our study was the availability of information about mental health status pre-dating the disaster. Our sample comprised community-dwelling survivors aged 65 and older, who responded to surveys in 2010 (i.e. one year before the disaster) and in 2013 ($n = 3464$). We categorized disaster exposure according to three types of experiences: loss of family/friends, property damage, and disruption in access to medical service. Our main outcome was change in depressive symptoms, measured by the 15-item geriatric depression scale (GDS). Among the participants, 917 (26.5%) reported losing a family member to the disaster, while a further 537 (15.5%) reported losing a friend. More than half of the participants reported some damage to their homes. After adjusting for demographics and baseline mental health, people whose homes were completely destroyed had significantly elevated depressive symptom scores three years later (+1.22 points, 95%CI: 0.80, 1.64, $p < 0.0001$). Disruption of psychiatric care was also associated with change in GDS scores (+2.51 points, 95%CI: 1.28, 3.74, $p < 0.0001$). By contrast, loss of family/friends was no longer associated with GDS after 3 years; +0.18 points (95%CI: -0.018, 0.37, $p = 0.08$) for loss of family, and -0.045 points (95%CI: -0.28, 0.19, $p = 0.71$) for loss of friends. Three years after the disaster, survivors of the 2011 earthquake and tsunami appeared to have recovered from loss of loved ones. By contrast, property loss and disruption of psychiatry care were associated with persistent adverse impact on mental health.

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1. Introduction

Previous studies have provided ample documentation of the impact of exposure to natural disasters on the mental health of survivors (Fergusson et al., 2014; Frankenberg et al., 2008; Kumar et al., 2007; van Griensven et al., 2006). Personal experience of property damage, loss of family and disruption of employment each has been linked to an increased incidence of PTSD, depression and anxiety among survivors (van Griensven et al., 2006). However, almost none of the existing studies were able to incorporate

information about the mental health of survivors *pre-dating* the exposure to disaster. Thus, it is not clear whether the symptoms of mental illness among survivors already pre-dated their experience of disaster. Retrospective recall of pre-disaster mental health status is also subject to recall bias.

One notable exception is a study reported by Fergusson et al. (2014), conducted after the Canterbury earthquakes in New Zealand during 2010–2011. In that study, the authors took advantage of the Christchurch Health and Development Study, a 35-year longitudinal birth cohort (635 males and 630 females), in which *pre-disaster* mental health information was available among the survivors. They reported that prevalence of some types of mental disorders (major depression, posttraumatic stress disorder, other anxiety disorder, and nicotine dependence) was significantly increased with increasing exposure to the earthquakes. However,

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after adjusting confounders that had been assessed before the earthquake, the significant positive associations were substantially attenuated except for nicotine dependence. Besides, the Christchurch cohort is still relatively young (age 35 years) and many participants have not yet accumulated substantial property (e.g. own their homes). We are unaware of studies that have focused on a population of older adults with information about mental health pre-dating the onset of disaster (which is very rare, and makes our natural experiment quite unique). In addition, few previous studies have been able to provide information on survivors for an extended period of follow-up, e.g. beyond one year after exposure to disaster. Thus, the persistent mental health impacts of disaster (if any) are not well understood.

To address these limitations of previous studies, we took advantage of a unique “natural experiment” (Craig et al., 2012), afforded by the ongoing Japan Gerontological Evaluation Study (JAGES), a nationwide cohort of older community-dwelling adults which was originally established in 2010 to examine prospectively the determinants of healthy aging (Fujiwara et al., 2014; Kondo, 2010; Matsuyama et al., 2014; Takeuchi et al., 2013). By chance, one of the field sites of the cohort was located in Iwanuma city, Miyagi Prefecture, roughly 80 km the west of the epicenter of the 2011 Earthquake and Tsunami. This design allowed us to conduct a follow-up study of survivors three years after the disaster.

2. Methods

2.1. Study population and study design

We utilized two surveys waves of the JAGES cohort conducted in 2010 (baseline) and in 2013 (in the aftermath of the East Japan

Earthquake). The study profile has been previously been described in detail (Hikichi et al., 2016). The East Japan Earthquake and Tsunami struck on March 11th, 2011. Iwanuma city, the field site for the present study, is a coastal municipality in Miyagi prefecture in Japan, located approximately 80 km west of the epicenter of the 3.11 earthquake. A total of 187 people have lost their lives or have been missing in Iwanuma, while 48% of the land mass was inundated by the tsunami (see Fig. 1) (Ishigaki et al., 2013).

The baseline survey was completed in August 2010, 7 months prior to the earthquake. Questionnaires were mailed to every resident of Iwanuma aged 65 years or older ($n = 8576$), inviting them to participate in the JAGES cohort study. The questionnaires inquired about demographics as well as the 15-item Geriatric Depression Scale (GDS). The response rate to the initial invitation was 59.0% (5058/8576), which is somewhat higher than the average among comparable community surveys of this type (Brick and Williams, 2013; JENKINS, 2010; Sinclair et al., 2012). From the 5,058, we further excluded 101 due to invalid ID, sex or age, leading to 4957 valid respondents in the baseline survey. Among the 4957 respondents, 577 were excluded for the follow-up: lost their life in the disaster ($n = 34$), death from the other (natural) causes ($n = 400$), moved out ($n = 92$), address unknown ($n = 17$), and too sick to be conducted ($n = 34$) (Fig. 2). The number of eligible participants for the follow-up survey was 4380. Approximately 2.5 years after the earthquake and tsunami, we mailed the follow-up survey to all survivors between Oct 2013 and Jan 2014. The follow-up survey again included the 15-item GDS, as well as questions related to personal experience of the disaster, such as property loss and the loss of loved ones. Trained survey teams then visited all the households to collect the completed surveys. Informed consent was obtained at the time of survey collection. The

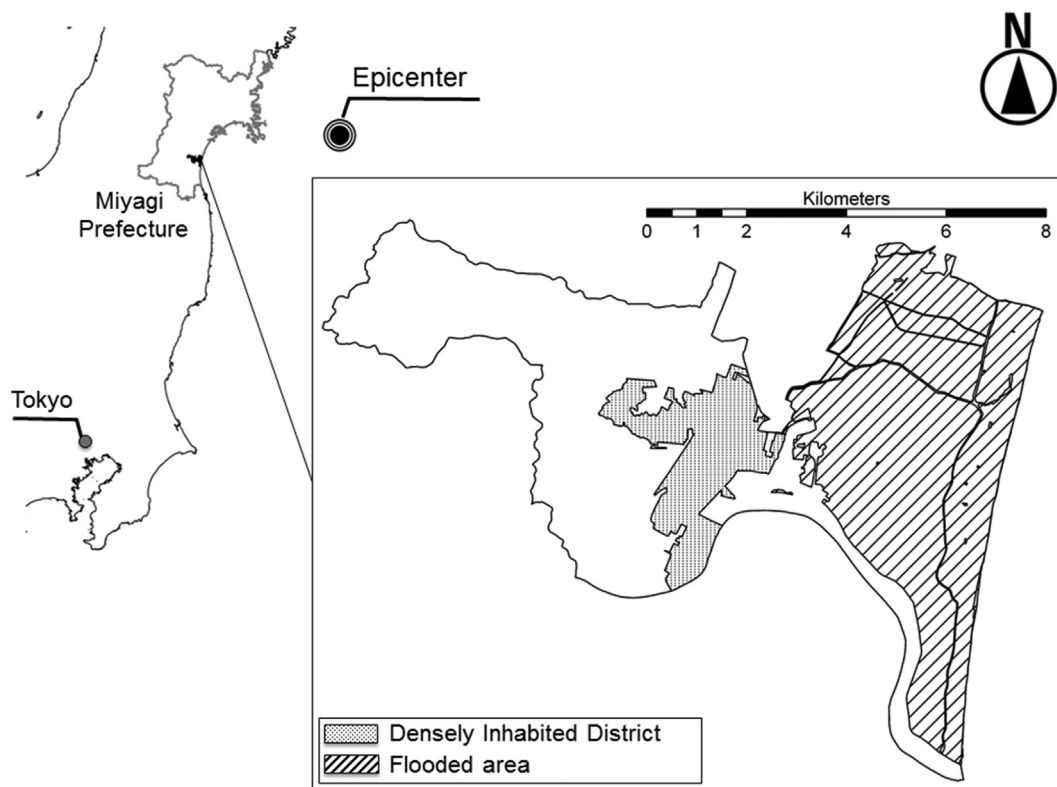


Fig. 1. A map of Iwanuma. Iwanuma is a coastal municipality in Miyagi prefecture in Japan, and is located approximately 80 km west of the epicenter of the 3.11 earthquake. A total of 187 people have lost their lives or have been missing in Iwanuma, while 48% of the land mass was inundated by the tsunami.

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