



## Surviving the 3/11 Disaster: Reflections of the Great East Japan Earthquake among Older Adults in Iwate Japan

Reggy Capacio Figer

Faculty of Media and Communication, Hokkaido University, Sapporo City, 060-0817, Japan

Corresponding author. E-Mail address: rcfiger@imc.hokudai.ac.jp

Received: 4 February 2021; Revised: 26 April 2021; Accepted: 3 May 2021

### Abstract

This article explores on older adults' thoughts and insights of the Great East Japan Earthquake that happened on March 11, 2011. Employing focused interviews among 15 elders, findings revealed that their views about life changed after experiencing the 3/11 disaster. Informants became more conscious in building as well as in developing their relationships with their family members and friends. They also underscored the importance of being prepared since disasters can happen at any time. Moreover, the idea of *tsunami-tendenko* (self-preservation) became apparent during the interviews. Informants, likewise, recognized the help and support of their neighborhood associations as they cope with the devastation of the 3/11 disaster. The collective efforts of different networks were demonstrated through the activities and programs for older adults. However, there is still a need for a more inclusive approach to disaster management where older adults can take part in. It is hoped that other older adults in Japan or elsewhere and those involved in disaster policy formulation and project development may learn from the lessons and insights from the informants in the study.

**Keywords:** Older Adults, Great East Japan Earthquake, Reflections, Disaster Awareness

### Introduction

Japan has high prevalence of natural disasters (Okada et al., 2013). One of the most shattering natural calamities happened on March 11, 2011 when a very strong earthquake of the scale of 9.0 occurred in East Japan (Japan Meteorological Agency (JMA), 2011). A half-hour later, a destructive tsunami eroded the entire towns and villages resulting to thousands of people dead and millions of properties damaged (Mimura et al., 2011). Fukushima, Iwate, and Miyagi were the severest prefectures hit by the disaster (Umezawa, 2014). Usually described as the Great East Japan Earthquake, this disaster has placed an indelible mark in the lives of those who survived especially from the older population – one of the most vulnerable sectors in times of disasters (Oven et al., 2019).

Aside from being susceptible to disasters, Japan has also the highest percentage of elderly people in the world (Sze-Yunn & Arivalagan, 2020). According to The World Bank (2019), about 25% of the whole population in Japan is over 65 years old. It is projected that the number of older adults will grow further to 40% by 2060 (Sze-Yunn & Arivalagan, 2020). This indicates that there will be more elderly people than the other age groups in Japan. It is vital, then, to provide specific consideration to the impacts of disasters on the elderly population so as to protect their welfare and well-being.

In times of catastrophic situations, older people's frail bodies and mental state may put them in a very challenging position. They may be "physically dependent to others for their evacuation before a disaster hits, survival during the disaster and recovery in the post-disaster phase" (Malak et al., 2020, p. 2). Moreover, their mental and emotional conditions may worsen as older adults are presumably to suffer post-traumatic stress disorder (PTSD) than adolescents (Parker et al., 2016) which may actually lead to their general psychiatric morbidity (Jia et al., 2010).



In the case of the 3/11 disaster, many elderly residents from the coastal areas died even though, after the earthquake, an hour warning was issued that a tsunami was imminent (Aida et al., 2017). There were also older adults who survived but died in the long run because of PTSD (Hikichi et al., 2016).

Damages to properties, demise of a kinfolk member or comrade, and relocation to a new place or community are the corollaries of disasters that may also produce distressing effects to the elderly people (Labra et al., 2018; Adams et al., 2011).

In this study, the author attempts to investigate older adults thoughts and feelings of their experiences of the Great East Japan Earthquake that happened in 2011. There is insufficient inquiries about the elderly survivors' views and sentiments that helped them manage and persevere with life after the 3/11 catastrophe. Therefore, it is hoped that this study will provide insights that will benefit other adults in Japan and elsewhere and those engaged in disaster management, response, and recovery through the lessons and learnings from the elderly survivors. Their insights and lessons learned from the 3/11 disaster can serve as a guide in drafting policies, strategies, and activities that will take into account the vulnerabilities of older adults especially in disasters.

### Methodology

In an effort to unearth older adults' experiences and perceptions about the disaster, a qualitative approach was used in this inquiry. This method was essential since the study dealt with older adults encounter of the Great East Japan Earthquake, hence, the need for exposition and elucidation of their unique individual experiences. Subsequently, this approach accentuated elderly people's subjective understanding and interpretation of the 3/11 disaster. Because this approach is inductive and representational in nature, the author was able to see how older adults understood and perceived their journey of the disaster. Through this method, older adults were presented a venue to impart lessons and learnings they utilized in order to endure and survive the adversity.

Focused interviews were carried out to realize the profundity of informants' experiences. Using open-ended questions, older adults were able to illuminate their views and reflections of what they lived through during the disaster. Among the three brutally hit prefectures, Iwate was chosen as the locale of the study. The author was able to establish contacts with key organizations in Iwate that assisted the victims of the disaster. This made the recruitment of informants unproblematic and straightforward.

Purposeful sampling was utilized in the selection of the study. This means that only information-rich subjects were interviewed. With the help of SAVE Iwate, Morioka City's reconstruction support group, and Morioka Goodwill Guides, a group of volunteers that introduces the history and culture of the city, 15 older adults were identified. These informants suffered first-hand the earthquake and tsunami since they resided in the coastal areas of Iwate before evacuating to the capital city of Morioka.

Focused interviews and purposeful sampling complemented fittingly with the qualitative approach as data responses and accounts were exhaustive and reflective – detailing older adults' individual construal and meaning of the disaster.

To safeguard the rights of human subjects, informants were advised of their participation as entirely on a voluntary basis. Should they decide to stop the interview at any time, they may do so. Prior to signing the consent form, informants were briefed about the interview process. Moreover, they were assured of their anonymity in the study. Permission for audio recording was also agreed upon by the informants. The interview lasted for about 40–90 minutes.



A professional Japanese translator mediated the informant and author during the interview session. Questions and responses were translated from Japanese to English and vice-versa. A research assistant transcribed interviews from the audiotapes while the author collated and chronicled his field notes. Some older adults opted to have questions and answers written because of hearing loss. Their replies were also translated to English. In order to verify the authenticity of the translation, another Japanese translator checked and modified a few of the transcriptions.

Data collected were placed in matrices and organized according to the questions. Themes and patterns were determined from the data set. Using inductive method, the themes that were ascertained afforded a genuine and an unadulterated description of elders' ordeals of the Great East Japan Earthquake.

## **Results**

The results of this study indicated that the average age of the informants was 75 years old. There were eight males, and the other seven were females. Most of the older adults interviewed were high school levels and graduates. There were three who were college levels. All participants were survivors who lived in the coastal areas of Iwate and moved to Morioka City after the 3/11 disaster.

Surviving a disaster is an immense challenge especially for the vulnerable group like the older adults. The journey of survivors in their subsistence and recovery process from undergoing the ordeal of the calamity takes a significant changing of views about the disaster, nurturing relationships, and engaging in productive and meaningful activities.

### **Reliving the Great East Japan Earthquake**

The interview started with informants recollecting the day when the earthquake transpired. After so many years passed, it seemed like yesterday that the big quake happened. They were still teary-eyed as they commenced talking about their individual experiences. They were in agreement that it was a hard time for them. There was scarcity of food. There was no electricity. Trains were down. They relied heavily on gas for cooking and their bicycles for mobility. Some of the informants were lamenting as they shared their stories of survival. Most of them either lost a family member or a good friend. All of them also concurred that the calamity washed out their lands they called home. The home they built with love and joy. Similarly, the community they fondly treasured vanished in just a few minutes. The devastation was just unimaginable. They all felt the pang of sadness every time a series of flashbacks would come along. The informant said:

Before the earthquake, I liked alcohol. I would drink it early so I could enjoy and relax in the evening. When I drink alcohol now, I remember the pain of the earthquake...I really want to cry!

He uttered that recently he does not drink alcohol anymore, so he will no longer remember the grim past of the catastrophe.

Another informant shared that her sister-in-law was swept by the tsunami. The informant knew, by then, that the family will not anymore find her. The next morning, after the tragedy, a some-sort of miracle happened. Waves carried her back to the shores close to the evacuation centre where the informant was staying.



She was still wearing the same clothes, not ripped or tattered. It was a mystery because we found her easily and she was found near our evacuation centre.

Then, the informant paused and stopped talking. She was close to tears but hindered herself from doing so.

Aside from grief of a deceased loved one or friend and the trauma of experiencing the devastating tsunami, another burden that older adults were compelled to go through was their ability to survive. With no cash at hand, they could not buy anything. There were also no shops as they were all wiped out. They pondered that, certainly, they survived the tsunami, but they fret they might not be able to survive from starvation. Good thing, help and support from government, private, and non-government organizations (NGOs) arrived immediately.

Moving to another city was also a major concern for the informants. They were anxious about the kind of life they would take part in with their new community. Originating from the coastal areas and moving to a landlocked city was an immense adjustment for them. This displacement considerably impacted, too, their mental health, informants said.

### **Being Prepared and Caring One's Own Survival**

Informants believed that the wounds left by anguish, loss, and wreckage brought by the earthquake and tsunami would never be forgotten. The soreness and nostalgia of the tragedy would always be part of their lives. Most of the informants deemed that there was a purpose why this had happened to them and that there was a meaning to all of this. In spite of the horror they witnessed, informants found the strength to allow themselves to be better and beyond the disaster.

Disaster preparedness was one of the common answers when asked how the disaster changed their views about life. They completely understood now the importance of being ready and primed all the time. As some informants expressed:

I realized the ancient saying that disasters will come when you forget about them is so true. I will never forget this experience...it is a lesson, and I always think what to do if I encounter the next disaster.

I do not know what will happen tomorrow so I always bring important things with me, keep my gasoline full, my cell phone fully charged...

...I have always been thinking about where to escape if a tsunami hits.

After the Great East Japan Earthquake, I prepared disaster prevention goods and put them in a familiar place so that I can take them out any time, and I will also pay attention to the TV and radio so that I can start the evacuation immediately when a tsunami warning is issued.

These responses proved how the disaster heightened informants' knowledge and preparedness in disaster. This finding is coherent with one of the essential points of Hoffmann and Muttarak's (2017) study on how previous disaster experience could increase disaster awareness and vigilance. Likewise, they added that education is an important factor for learning and predicting disaster hazards.

The informants, furthermore, talked about the concept of *tsunami-tendenko*. These words came from Fumio Yamashita, a historian in Japanese tsunami calamities, on how he depicted his experience of the huge tsunami that hit Japan in 1933 (Kodama, 2013). According to Sekine (2011), the embedded meaning of this concept is "when you anticipate tsunami, each person should escape separately...by all means, run to a hill quickly, ignore



even your parents and children; think only of yourself not to be sacrificed, and even if your parents die, no one should blame it” (p. 1). In other words, one has to take care of oneself in order to survive from the tsunami.

As one informant articulated:

If I encounter the disaster and that I am outside of my house, I will keep in mind the words “tsunami tendenko”, even if your family is at home, “Do not return home, “Do not wait for their return”.

Each member of the family should think about his or her own evacuation and not depend on others.

Though the concept encourages protection or preservation of oneself during a disaster, Yamori (2014) in his paper explains that *tendenko* is a profound term that operates on “(1) emphasizing the principle of self-reliance; (2) encouraging others to seek refuge; (3) fostering mutual trust in advance; and (4) reducing feelings of self-reproach among survivors” (p. 49).

To elucidate this, an informant narrated her story. She recounted that while she and her husband were on their way to the evacuation centre by car, they saw an elderly couple trying to go to higher grounds. She said that she encouraged the couple to get into the car so they could evacuate faster. She felt the need to help the couple since they were anyway en route to the evacuation centre. Though the couple did not know them, they trusted them for their survival. This situation is another aspect of *tsunami-tendenko*. Aside from self-preservation, *tsunami-tendenko* can also function as a way to assist others to leave the place and to trust each other in times of disaster (Yamori, 2014). The informants believed that they survived because of doing *tsunami-tendenko*. They held that if there was a way to help, then help; but the top priority was one’s own safety and that was to survive from the tsunami.

Reframing their perspective about the disaster gave the informants more courage and positivity as they continued their journey towards life. They hoped that being prepared always and looking for oneself in times of disasters will provide them more chances of survival should another disaster happens.

### Dis/Connecting Relationships

Informants considered that relationships with family members, friends, or/and community members were fundamental in order to endure the aftermath of the disaster. Informants, however, said that their connection with some of their family members, friends or/and community members were cut off by reason of death or displacement. As some informants pointed out:

All relation (connection) so far has been lost. They were residents before the earthquake.

After the tsunami, we were separated with our friends, relatives, and neighbours. The connection became weaker and lesser than before the disaster.

But there was, similarly, this desire and conscious effort to build and develop new relationships (may it be for friends or partner), as one informant exclaimed: “I honestly want to make new relationship (connection)”. Another informant wished that he develops new acquaintances soon: “Now I am living in a different city with a different community from before so I have a weak or no connection with the people here at this time”.

This yearning to have new relationships, conversely, was problematic to some of the informants in the study. They felt that they “do not really belong” to their new community in Morioka. Informants revealed that they could only have a “real” connection with someone if he/she resided in the coastal areas or if he/she belonged to the





same area as before. These informants supposed that residents from Morioka City could and would never empathize or understand their experience of the disaster and their way of life in the coastal areas. Hence, their relationships with the people from Morioka were civil and distant, but never attached or intimate. As an informant verbalized:

Through our hobbies such golf and mah-jong, I have become more connected with the elderly people of the same age. But only 1–2 people I can really get along well and talk with them from the bottom of my heart. (The ones I can really associate with are those who moved from Shiwa Towan from the Kesen district after the disaster).

With the family members, relatives, and friends that they have been together before and after the disaster, informants disclosed that their relationships with them became better. They were able to see and feel the importance of each other and how valuable personal networks were especially in times of disasters. Some of the informants uttered:

I think the connection has deepened. I learned that it is important to help each other when we're in trouble.

...since there is another victim who lost his house who has moved to the neighbourhood, I try to say hello and have daily conversations with him in order to deepen the bond.

Since we have been helping each other, the bonds became stronger.

...I have relatives in Miyako and their house was washed away. I loaded rice and crops in the car and went straight to my relatives. I have regained an unexpected connection thru the earthquake because I was reunited with my relatives.

The feeling of helping each other is stronger than before. Regardless of the disaster, we always help or support each other.

Disasters can make or break relationships. Just like the case of the 3/11 disaster, the tsunami separated and displaced people; equally, it also fostered new relationships as well as stronger bonds within their family and friends.

### **Engaging Older Adults**

Informants held that one of the reasons why they still endure and continue to live through the rigors of life is their participation to different activities and programs initiated by the national and/or local government as well as by their own neighbourhood associations that they belong to. Selected events happen once a week, others on a monthly basis; while a few are done annually.

I go every year (local entertainment festival, music festival, concert, movie watching party, sports event, walking, meal cooking and enjoying party...some are held once or twice, and some are held on a monthly basis. We also have tea persons meeting which I attend every month.

Elderly people's association, Igo and Shogi (Japanese traditional games) competitions, tea party, karaoke, hand work fair were held 5–6 times a month.

One informant deemed that these activities made him feel unperturbed. It also provided merriment to his despondent life. He said: "There were a lot of relaxation and help events in the affected areas, and I got cheered up by all of this. As I participated more and more, I got to know each other and we talked with one another".



He added that: “5 music therapists from Hanamaki City visited us. World renowned musician visited us. 1–2 times/year. Tea party for senior citizens and dinner parties 4 times/year while we play games and do karaoke”. These activities afforded them the opportunity to loosen up and be amused by the different events.

Aside from these entertaining and relaxing activities, the informants were also kept abreast with the current disaster situation and preparedness by the local government or their neighbourhood associations. Being informed will make older adults more confident with themselves as their knowledge and skills in disaster situations will be upgraded; consequently, their decisions and actions will be better calculated and premeditated, and hopefully will help reduce the effects of disasters on them.

Some informants were not able to attend these activities and/or programs because of work. Despite their age, they still wanted to earn money because most of their properties and belongings were destroyed by the tsunami.

Based on the activities and programs, the idea of networking was notably manifested in this study. People from the local government, elderly associations, NGOs helped and supported each other in order to improve the physical and mental condition of older adults who survived the 3/11 disaster. Through the resilient connection and compassion among different institutions, older adults were provided a holistic approach to disaster management and recovery. They were treated with relaxation activities as well as venues to interact and meet people. Social contact helped lessen the trauma and stress. These activities, too, facilitated the informants to forget about their worries and be optimistic about the future.

Because of this connectivity among different organizations, informants became more cognizant about disasters. The sharing of information, knowledge, and other resources coming from legitimate institutions is an effective way for community members to effectively manage, mitigate, and respond to disaster situations.

Informants corresponded that engaging them to different activities and programs greatly abetted in the improvement of their physical and mental health.

### **Discussion and Conclusion**

This study delved into the insights and viewpoints of older adults in Iwate regarding the Great East Japan Earthquake that happened on March 11, 2011. In the interviews conducted, informants relived their experiences. Some of them had difficulty in describing what happened, while a few of them dissolved in tears. The destruction was just extreme. Their houses and properties were all washed out. The hardest part was losing loved ones – a family member, relative or friend. They needed to deal with the trauma every now and then. Besides, they had to cope with the stresses of living in the present time. The study of Kako and Mayner (2019) reports the same findings that trauma and mental health issues were imperative concerns of older adults who outlived the 3/11 disaster. Furthermore, informants had to move to Morioka City to start anew. This displacement greatly affected them, too. Kamo et al. (2011) hold similar results when they studied the adverse consequences of displacement on the mental welfare among older adults who were uprooted from their homes in New Orleans by Hurricane Katrina.

Because of the 3/11 disaster, informants changed their views about life in general. They became more mindful of their environment. Their sensitivity to earthquakes was amplified. Hence, their disaster preparedness was also intensified. Their disaster kits were always ready in case another natural calamity strikes. Though in this study, informants were not able to explain in details their disaster preparedness, knowledge, and skills, it is hoped that



their readiness gained from trainings and meetings from disaster managers were uniquely tailored to their needs since this could significantly enhanced their disaster vigilance and resilience (Shih et al., 2018).

Aside from being prepared, the informants also believed that the concept of *tsunami-tendenko* should be practiced by everyone. Saving one's own life must be the utmost concern of oneself. Though this notion predisposes to being self-centred and egocentric, Kodama (2013) believes, otherwise. He thinks that if many people follow it, there will be more people who will survive from the tsunami (Kodama, 2013). In his words:

I believe that while one can certainly follow *tsunami-tendenko* from an egoistic motive, it is not an egoistic maxim but rather a teaching justified by indirect consequentialism. It is consequentialist because the purpose of *tsunami-tendenko* is to maximise the number of lives saved. It is indirect because the rule of action individuals are expected to follow is not one of maximising the number of lives one can directly save, but of saving one's own life to collectively maximise the total number of lives saved. To achieve this goal, one needs to internalise *tsunami-tendenko* and also cultivate trust among all concerned to guarantee they will also follow the maxim. (Kodama, 2013, p. 362).

Informants were separated from their friends and some of their relatives, who either moved to other cities or died from the tsunami. Informants needed to establish again friendships in their new communities. Among the survivors who moved to Morioka with their families, they became closer with one another. They realized the value and importance of their families and friends who had gone through the same harrowing experience as they did. Though it was a traumatic experience, it became the tie that binds them together. They helped and supported each other because they knew that they could rely on each other's back.

The involvement of the informants to different activities instigated by the local government and different neighbourhood associations helped significantly in older adults survival of the 3/11 disaster. Needless to say, these activities provided them avenues to unwind and enjoy, and for a time forget the anxieties and worries that they were suffering from. Studies show that older people who participate in different social and productive activities are able to maintain their well-being (Kadariya et al., 2019). Similarly, they are less likely to lower their risk in developing health problems (McPhee et al., 2016). They are happier and less depressed, hence, they could have a longer life span (Chei et al., 2018).

The insights provided by the informants are noteworthy for other older adults in Japan and elsewhere. They can learn from informants' experiences and hopefully become more spirited and prepared during and after disasters. Informants' reflections are also crucial to understand older adults' struggles as well as their great efforts to survive and endure life. It is yearned that this study will influence decision-making and project/program development in terms of disaster management, response, and recovery for elderly people especially in calamity-prone regions.

It is also critical for the family and community to engage in the planning and preparation for disaster response and recovery since they have the local knowledge and experience when it comes to disasters (Takeuchi et al., 2011). It is important, therefore, to form networks among families and neighbourhoods to improve preparation for disasters and secure and protect the well-being of those in the vulnerable sectors like the older adults. Accordingly, these networks act a significant role in different stages of disaster management. In the case of 3/11 disaster, warning systems of the earthquake and tsunami were in place. Plans for evacuation and other measures were also ready. But because the subjects of the study were older adults, their frail bodies and slow mobility had put them in a more vulnerable situation during the 3/11 disaster. Hence, training older adults for survival in





disaster situations is imperative. Capacity development of the community which they belong to must be cultivated and fostered. Intervention teams should also be set up primarily for older adults for evacuation procedure and rescue.

The author believes that aside from preparing older adults to be competent and resilient in disaster situations, it is likewise important to provide pre-disaster preparedness and action plans uniquely tailored to elderly in different communities as well as in healthcare maintenance and protection facilities. In this way, the impact of disasters to older adults may be lessened.

In conclusion, the informants still experienced the feelings of sadness and trauma brought about by the 3/11 disaster. Their accounts disclosed how they withstood immense agonies from the disaster. They recalled how the concept of *tsunami-tendenko* helped them survived. The author believes that national governments of different countries should encourage the concept of *tsunami-tendenko* to their constituents. It is important that “self-preservation” during disasters be taught already in elementary schools so that children may instill in their hearts and minds the value of one’s survival in disasters. Hopefully, they are going to bring this value with them until they grow up and become older adults.

Moreover, the help and support from the government, NGOs, and their neighbourhood associations greatly assisted them to cope and survive. The immediate response from different institutions to provide food, shelter, and medical help made a lot of difference in saving more lives. The element of time and fast action are necessary for disaster recovery and rescue. It is also essential to maximize the potential of networks in disaster management. The author supposes that through networking, inclusivity in disaster management can be achieved. This can decrease the loss of lives, especially with the vulnerable people, like the older adults.

Informants’ memories and reflections about the 3/11 disaster are important sources of knowledge which can offer communities fundamental evidence on the threat and risk of the environment in Iwate. For disaster managers, these will help them avail insights into community awareness and action and develop better communication and instruction with local communities.

One informant ended her interview by saying: “It was a very traumatic experience, but I am glad I survived. I am still here...” Hopefully their insights and reflections will resonate lessons and learnings to other elderly people and to those places where disasters are always prevalent.

### Acknowledgments

This work was supported by JSPS Grant Number JP19K11268.

### References

- Adams, V., Kaufman, S. R., van Hattum, T., & Moody, S. (2011). Aging Disaster: Mortality, Vulnerability, and Long-term Recovery among Katrina Survivors. *Medical Anthropology*, 30(3), 247–270. <https://doi.org/10.1080/01459740.2011.560777>
- Aida, J., Hikichi, H., Matsuyama, Y., Sato, Y., Tsuboya, T., Tabuchi, T., Koyama, S., Subramanian, S. V., Kondo, K., Osaka, K., & Kawachi, I. (2017). Risk of Mortality during and after the 2011 Great East Japan Earthquake and Tsunami among Older Coastal Residents. *Scientific Reports*, 7, 16591. <https://doi.org/10.1038/s41598-017-16636-3>



Chei, C.-L., Lee, J. M.-L., Ma, S., & Malhotra, R. (2018). Happy Older People Live Longer. *Age and Ageing*, 47(6), 860–866. <https://doi.org/10.1093/ageing/afy128>

Hikichi, H., Aida, J., Tsuboya, T., Kondo, K., & Kawachi, I. (2016). Can Community Social Cohesion Prevent Posttraumatic Stress Disorder in the Aftermath of a Disaster? A Natural Experiment from the 2011 Tohoku Earthquake and Tsunami. *American Journal of Epidemiology*, 183(10), 902–910. <https://doi.org/10.1093/aje/kwv335>

Hoffmann, R., & Muttarak, R. (2017). Learn from the Past, Prepare for the Future: Impacts of Education and Experience on Disaster Preparedness in the Philippines and Thailand. *World Development*, 96, 32–51. <https://doi.org/10.1016/j.worlddev.2017.02.016>

Japan Meteorological Agency (JMA). (2011). *Information on the 2011 Great East Japan Earthquake*. Retrieved from [https://www.jma.go.jp/jma/en/2011\\_Earthquake/Information\\_on\\_2011\\_Earthquake.html](https://www.jma.go.jp/jma/en/2011_Earthquake/Information_on_2011_Earthquake.html)

Jia, Z., Tian, W., Liu, W., Cao, Y., Yan, J., & Shun, Z. (2010). Are the Elderly more Vulnerable to Psychological Impact of Natural Disaster? A Population-based Survey of Adult Survivors of the 2008 Sichuan Earthquake. *BMC Public Health*, 10, 172. <https://doi.org/10.1186/1471-2458-10-172>

Kadariya, S., Gautam, R., & Aro, A. R. (2019). Physical Activity, Mental Health, and Wellbeing among Older Adults in South and Southeast Asia: A Scoping Review. *BioMed Research International*, 2019, 6752182. <https://doi.org/10.1155/2019/6752182>

Kako, M., & Mayner, L. (2019). The Experience of Older People in Japan Four Years after the Tsunami. *Collegian*, 26(1), 125–131. <https://doi.org/10.1016/j.colegn.2018.06.001>

Kamo, Y., Henderson, T. L., & Roberto, K. A. (2011). Displaced Older Adults' Reactions to and Coping with the Aftermath of Hurricane Katrina. *Journal of Family Issues*, 32(10), 1346–1370. <https://doi.org/10.1177/0192513X11412495>

Kodama, S. (2013). Tsunami-Tendenko and Morality in Disasters. *Journal of Medical Ethics*, 41(5), 361–363. <http://doi.org/10.1136/medethics-2012-100813>

Labra, O., Maltais, D., & Gingras-Lacroix, G. (2018). Medium-Term Health of Seniors Following Exposure to a Natural Disaster. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 55, 1–11. <https://doi.org/10.1177/0046958018766667>

Malak, M. A., Sajib, A. M., Quader, M. A., & Anjum, H. (2020). “We are Feeling Older than our Age”: Vulnerability and Adaptive Strategies of Aging People to Cyclones in Coastal Bangladesh. *International Journal of Disaster Risk Reduction*, 48, 1–12. <https://doi.org/10.1016/j.ijdrr.2020.101595>



McPhee, J. S., French, D. P., Jackson, D., Nazroo, J., Pendleton, N., & Degens, H. (2016). Physical Activity in Older Age: Perspectives for Healthy Ageing and Frailty. *Biogerontology*, 17(3), 567–580. <https://doi.org/10.1007/s10522-016-9641-0>

Mimura, N., Yasuhara, K., Kawagoe, S., Yokoki, H., & Kazama, S. (2011). Damage from the Great East Japan Earthquake and Tsunami—A Quick Report. *Mitigation and Adaptation Strategies for Global Change*, 16, 803–818. <https://doi.org/10.1007/s11027-011-9297-7>

Okada, N., Fang, L., & Kilgour, D. M. (2013). Community-based Decision Making in Japan. *Group Decision Negotiation*, 22, 45–52. <https://doi.org/10.1007/s10726-012-9320-8>

Oven, K. J., Wistow, J., & Curtis, S. E. (2019). Older People and Climate Change: The Social and Physical Nexus of Vulnerability and Resilience to Extreme Weather in Urban and Rural Settings in England. In L. R. Mason, & J. Rigg (Eds.), *People and Climate Change: Vulnerability, Adaptation, and Social Justice* (pp. 68–83). USA: Oxford University Press.

Parker, G., Lie, D., Siskind, D. J., Martin-Khan, M., Raphael, B., Crompton, D., & Kisely, S. (2016). Mental Health Implications for Older Adults after Natural Disasters—A Systematic Review and Meta-Analysis. *International Psychogeriatrics*, 28(1), 11–20. <https://doi.org/10.1017/S1041610215001210>

Sekine, R. (2011). Did the People Practice “Tsunami Tendenko”?—The Reality of the 3.11 Tsunami which Attacked Shizugawa Area, Minamisanriku Town, Miyagi Prefecture. In *The 2011 East Japan Earthquake Bulletin of the Tohoku Geographical Association*. Retrieved from <http://tohokugeo.jp/articles/e-contents22.html>

Shih, R. A., Acosta, J. D., Chen, E. K., Carbone, E. G., Xenakis, L., Adamson, D. M., & Chandra, A. (2018). *Improving Disaster Resilience among Older Adults: Insights from Public Health Departments and Aging-in-Place Efforts*. Santa Monica, CA: RAND Corporation. Retrieved from [https://www.rand.org/pubs/research\\_reports/RR2313.html](https://www.rand.org/pubs/research_reports/RR2313.html)

Sze-Yunn, P., & Arivalagan, Y. (2020, February 18). *These Countries are Most Ready to Deal with Ageing Populations*. Retrieved from <https://www.weforum.org/agenda/2020/02/what-are-japan-and-singapore-doing-about-ageing-population/>

Takeuchi, Y., Mulyasari, F., & Shaw, R. (2011). Chapter 4 Roles of Family and Community in Disaster Education. In R. Shaw, K. Shiwaku, & Y. Takeuchi (Eds.), *Disaster Education (Community, Environment and Disaster Risk Management)*, Vol. 7 (pp. 77–94). Bingley: Emerald Group Publishing. [https://doi.org/10.1108/S2040-7262\(2011\)0000007010](https://doi.org/10.1108/S2040-7262(2011)0000007010)

The World Bank. (2019). *Population Ages 65 and Above (% of Total Population)*. Retrieved from <https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS>



Umezawa, S. (2014). The Great East Japan Earthquake: Its Damages, Impacts on the Labor-economy and Restoration Measures of the Government. *E-Journal of International and Comparative Labour Studies*, 3(3), 145-174. Retrieved from [http://ejcls.adapt.it/index.php/ejcls\\_adapt/article/view/240](http://ejcls.adapt.it/index.php/ejcls_adapt/article/view/240)

Yamori, K. (2014). Revisiting the Concept of Tsunami Tendenko: Tsunami Evacuation Behavior in the Great East Japan Earthquake. In H. Kawase (Ed.), *Studies on the 2011 Off the Pacific Coast of Tohoku Earthquake. Natural Disaster Science and Mitigation Engineering: DPRI Reports* (pp. 49-63). Tokyo: Springer. [https://doi.org/10.1007/978-4-431-54418-0\\_5](https://doi.org/10.1007/978-4-431-54418-0_5)

