Chapter 7
Disaster, Social Capital, and Health

Jun Aida, Ichiro Kawachi, S.V. Subramanian, and Katsunori Kondo

Disasters are widely recognized as causing major public health problems (Limpakarnjanarat & Ofrin, 2009; Noji, 2005) and are responsible for morbidity, sudden and otherwise, among individuals. For example, approximately 280,000 people in Asian countries died following the severe earthquake and tsunami in Indonesia in December 2004 (Kohl, O'Rourke, Schmidman, Dopkin, & Birnbaum, 2005). In January 2010, 222,570 people died following the Haiti earthquake, while 72,210 deaths resulted from the summer heat wave in Western Europe in 2003 (Knight, 2011). Worldwide, there were 406 natural disasters and 234 technological disasters in 2010, which caused 297,752 and 6,724 deaths, respectively (Center for Research on the Epidemiology of Disasters, 2012).

Disasters also cause serious physical and mental health problems in populations (Hussain, Weisaeth, & Heir, 2011; Neria, Nandi, & Galea, 2008; Perlman et al., 2011; Reacher et al., 2004; Thienkrua et al., 2006; van Griensven et al., 2006; Yzermans et al., 2005). It is common for the general population to be exposed to disasters during their lifespan; 22 % of individuals are exposed to one or more natural disasters in their lifetime (Briere & Elliott, 2000). Recent increases in population, aging, poverty, and globalization have made communities more vulnerable to disasters (Arnold, 2002). Trends in the number of disasters and damage caused by

J. Aida, D.D.S., M.P.H., Ph.D. (✉)
Department of International and Community Oral Health, Graduate School of Dentistry, Tohoku University, 4-1, Seiryo-machi, Aoba-ku, Sendai, Miyagi 980-8575, Japan
e-mail: j-aida@umin.ac.jp

I. Kawachi, M.D., Ph.D. • S.V. Subramanian, Ph.D.
Department of Social and Behavioral Sciences, Harvard School of Public Health, Harvard University, Huntington Avenue 677, Kresge Bldg., 7th floor, Boston, MA 02115, USA
e-mail: ikawachi@hsph.harvard.edu; svsubram@hsph.harvard.edu

K. Kondo, M.D., Ph.D.
Center for Well-being and Society, Nihon Fukushi University, 5-22-35 Chiyoda, Naka-ku, Nagoya, 460-0012, Japan
e-mail: kkondo@n-fukushi.ac.jp

I. Kawachi et al. (eds.), *Global Perspectives on Social Capital and Health*,
DOI 10.1007/978-1-4614-7464-7_7,

disasters are increasing (Center for Research on the Epidemiology of Disasters, 2012; Limpakarnjanarat & Ofrin, 2009). Therefore, it is important for population health to study the impact of disasters on morbidity.

In addition to fatalities and morbidity, disasters also destroy the physical and social environment, including the community, social network, healthcare system, work environment, and various infrastructures. In 2010, the economic costs associated with natural disasters reached $123.3 billion (Knight, 2011). These huge changes in environments caused by disasters also affect the population health in the long term. Access to care for chronic illnesses is interrupted by the conditions caused by a disaster (Jhung et al., 2007). Lack of access to routine healthcare causes mortality following a disaster (Spiegel, Sheik, Gotway-Crawford, & Salama, 2002). Forced relocation following the destruction of a community caused by a disaster also increases health problems (Uscher-Pines, 2009; Yzermans et al., 2005). Because natural disasters affected 304 million people in 2010 (Knight, 2011), the impact on the population health in the long term can be crucial.

A certain amount of impact from disasters is considered to be mitigable (Levac, Toal-Sullivan, & O'Sullivan, 2012; Limpakarnjanarat & Ofrin, 2009). Disparities exist between communities that are vulnerable to disasters and the speed in responding to and recovering from a disaster. Although it is commonly assumed that the speed of recovery following a disaster will be determined primarily by the extent of the initial damage and economic conditions, recent research has begun to challenge this assumption (Aldrich, 2011). Not only have technical solutions been proposed to reduce the threat of disasters, but social solutions have been proposed as well (Nakagawa & Shaw, 2004). Social capital has drawn increased attention as a key factor in relation to a disaster.

This chapter explains the important role that social capital plays in disaster impact reduction and health following a disaster. At first, we introduce the conceptual backgrounds of disaster research and contribution of social capital on each disaster phase. Reports on disaster and social capital are reviewed. Then we discuss the roles of social capital on health in disaster settings. Epidemiological studies on disaster and health are also reviewed. Finally, we suggest directions for further research on social capital and health in disaster settings.

7.1 Social Capital and Disasters

7.1.1 Variability in the Use of Social Capital in Disaster Research

An emerging puzzle in disaster research is determining what accounts for the differential recovery rate of communities (Aldrich, 2011). From a disaster preparedness perspective, the extent of communities' vulnerability can be predicted from physical characteristics. For example, in the 1995 earthquake that rocked the Kobe

area of Japan, older wooden houses were significantly associated with worse fire damage (Murosaki, 2007). In the Indian Ocean tsunami, the extent of damage correlated with the distance from the epicenter, as well as the slope of the land, water depth, and topography (Ramakrishnan, Ghosh, Raja, Chandran, & Jeyram, 2005). However, in contrast to these well-understood predictors of differential vulnerability during the acute phase of a disaster, far less is understood about the phenomenon of differential recovery. It is commonly assumed that the speed of recovery following a disaster will be determined primarily by the extent of the initial damage, but recent research has begun to challenge this assumption (Aldrich, 2011). For example, researchers noted in the aftermath of the Kobe earthquake that neighborhoods recovered at different rates, but these rates were not strongly correlated with the scale of initial damage (Aldrich, 2011). Instead, disaster research has begun to identify a list of community-level factors that appear to facilitate or impede recovery, including population density, socioeconomic status, and community levels of economic inequality (Ahern & Galea, 2006; Aldrich, 2011). Another community-level variable that has drawn increasing attention is social capital (Nakagawa & Shaw, 2004).

7.1.2 Categorization and Phases of the Disaster

There are two broad categories in disasters: natural and human generated (Limpakarnjanarat & Ofrin, 2009; Rutherford & de Boer, 1983). Natural disasters include such events as earthquakes, tsunamis, hurricanes, floods, volcanoes, wildfires, and extremes of temperature. Human-generated disasters are divided into two categories: accidental (technological) disasters, such as chemical factory explosions, and man-made disasters caused by warfare, economic or social disruptions, and civil disturbances. Sometimes, the distinction between natural and human-generated disasters is unclear (Limpakarnjanarat & Ofrin, 2009; Neria et al., 2008) because some human-generated disasters are caused by natural disasters [e.g., a flood may cause chemical contamination (Appel, 2005)].

Previous literature related to disasters has divided disasters into several phases (Limpakarnjanarat & Ofrin, 2009; Moore et al., 2004). Following the previous research on social capital and disasters, this chapter identifies the following phases: preparedness, response and relief, and recovery. Preparedness is the knowledge, capabilities, and actions of governments, organizations, community groups, and individuals to effectively anticipate, respond to, and recover from the impacts of disasters (Levac et al., 2012). Disaster preparedness planning is crucial to reduce the impact of disasters (Levac et al., 2012; Limpakarnjanarat & Ofrin, 2009). It includes determining the community's vulnerability, developing emergency planning, and stocking an emergency kit, food, water, and medical supplies in homes (Levac et al., 2012). Disaster response and relief refers to the actions taken during or after a disaster to preserve life and meet the basic subsistence needs of victims (Limpakarnjanarat & Ofrin, 2009). The efforts involved in response or relief can be protracted over a prolonged duration. Recovery is the efforts involved in restoring or improving the

pre-disaster living conditions of the affected community, which include reducing the disaster risk. Recently, resilience (i.e., the community's intrinsic capacity to resist and recover from disasters) (Castleden, McKee, Murray, & Leonardi, 2011) has become increasingly important in disaster preparedness (Levac et al., 2012).

7.1.3 Social Capital and the Phases of a Disaster

Social capital, which is related to social support, formal and informal social ties, organizational linkages and cooperation, citizen participation, leadership and roles, attachment to a place, and a sense of community, potentially affects the impact of disasters as well as economic development, information and communication, and community competence (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). Studies have shown the various roles of social capital in each disaster phase: preparedness (Allen, 2006; Koh, Elqura, Judge, & Stoto, 2008; Levac et al., 2012), response to disasters (Brouwer & Nhassengo, 2006; Moore et al., 2004), relief (Moore et al., 2004), and disaster recovery (Aghabakhshi & Gregor, 2007; Aldrich, 2012; Buckland & Rahman, 1999; Nakagawa & Shaw, 2004). In addition, social capital is considered to be a key element of resilience (Allen, 2006; Castleden et al., 2011; Cox & Perry, 2011; Dynes, 2005; Ebi, 2011; Levac et al., 2012; Norris et al., 2008), as well as of communication, learning, adaptation, and risk awareness (Castleden et al., 2011). As part of the contribution of social capital on disaster impact, the beneficial effects of social capital on health following a disaster were also reported (Ali, Farooq, Bhatti, & Kuroiwa, 2012; Beaudoin, 2007; Beiser, Wiwa, & Adebajo, 2010; Wind, Fordham, & Komproe, 2011; Wind & Komproe, 2012). Figure 7.1 shows the concept of social capital as it is applied to disaster settings.

7.1.4 Findings Regarding Social Capital and Disaster

In this section, we introduce the roles that social capital plays in each phase of disaster by reviewing several articles on social capital and disaster.

Hanshin-Awaji Earthquake in Japan, 1995

Nakagawa and Shaw (2004) reported the various roles that social capital plays in disaster resistance and recovery and suggested the importance of social capital to resilience. On January 17, 1995, at 5:46 a.m., an earthquake with a magnitude of 7.2 on the Richter scale struck the Hanshin-Awaji area of Japan. More than 6,400 people died, 43,000 people were injured, 104,000 homes were completely destroyed by the earthquake, and 7,000 homes were completely destroyed by fires. During the disaster, the government had limited operational capacity; thus, individuals and their neighbors played important roles in responding to the disaster. In the Mano area

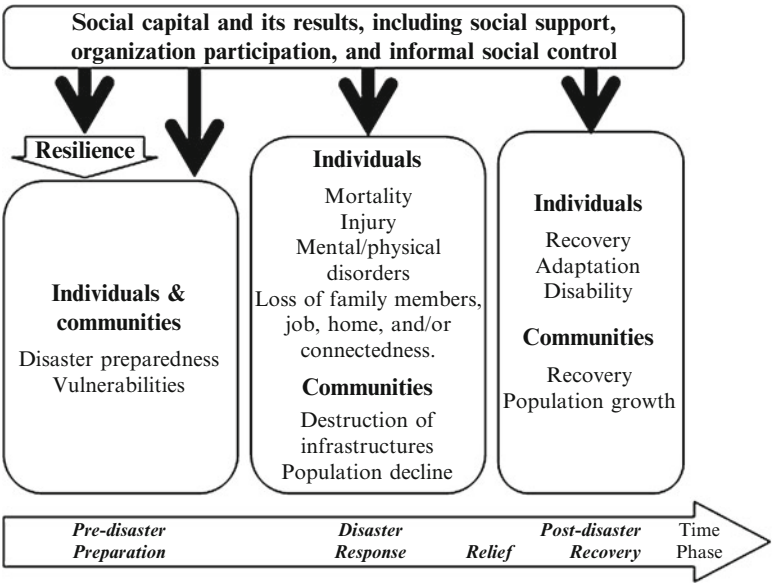

Fig. 7.1 Time and phases of disasters and social capital

of Kobe, town development organizations and a historically active civic movement were in place prior to the earthquake. After the earthquake, intensive community activities were conducted, including extinguishing fires immediately after the earthquake, pursuing rescue efforts, evacuating affected residents to nearby schools, establishing a community kitchen, and providing night guards. The fire-related efforts produced a remarkable contrast between the disaster-related outcomes of the Mano area and the Chitose area, where fires destroyed nearly everything. After the disaster, various community activities, such as conducting building inspection surveys, publishing a weekly community newsletter, implementing a signature collection campaign, and lobbying for the construction of public housing, resulted in more rapid adaptation and recovery. During the reconstruction, there were many difficulties (e.g., negotiations between residents and the government), and there were obvious differences in the speed and the degree of community involvement. Bonding, bridging, and linking social capital were considered to explain the differences between the two towns' recovery from the disaster.

Aldrich (2011) also examined the association between social capital and recovery following the Hanshin-Awaji earthquake. His quantitative data analysis revealed that the number of NPOs created per capita, used as a social capital variable, was significantly associated with recovery, measured by population growth and adjusted for damage, population density, economic conditions, inequality, and other variables. Importantly, his results showed that social capital was the strongest and most robust predictor of population recovery after a catastrophe.

Red River Flood in Canada, 1997

Buckland and Rahman (1999) showed the associations between social capital, community preparedness, and response to disaster. During the Red River Flood in Manitoba, Canada, in the spring of 1997, commonly referred to as the "Flood of the Century," the flooded river covered 2,000 km^2, and an estimated 25,000 residents were forced to flee their homes. Research was conducted immediately following the spring flood, from May through October 1997, in three riverine communities: Roseau River Anishinabe First Nation, Rosenort, and Saint Jean Baptiste. Social capital was measured by involvement in civic organizations. Residents who had a greater amount of social capital tended to prepare and respond to the disaster through civic organizations. In Rosenort and Saint Jean Baptiste, 53 % and 22 % of respondents, respectively, participated in flood preparation and response through their civic organizations. In the community with the least social capital, only 6 % of respondents from Roseau River participated in disaster-related activities. In relation to household-level preparation and response, such as building a sandbag dike in the upstream area following the flood, respondents in Roseau River were reported to have engaged in the fewest preparation activities. Although greater social capital was associated with a greater amount of disaster preparation activities and responses, it was also associated with more conflicts. Conflicts during various phases of the flood were frequently reported in Rosenort. In Roseau River, which had the least amount of social capital, only a small number of conflicts were reported. Social capital was considered to *"foster greater co-operation through exploitation of pre-existing networks, but it can also lead to greater conflict in decision-making as a result of flatter social structure"* (Buckland & Rahman, 1999).

Hurricane Floyd in the United States, 1999

The contribution of social capital, social cohesion, and collective efficacy to community preparedness, responsiveness, relief, and recovery from a flood caused by Hurricane Floyd in the United States was examined by Moore et al. (2004). On September 16, 1999, in the early morning hours, Hurricane Floyd hit Cape Fear, North Carolina, USA. The massive rain caused flooding along three river basins: Northeast Cape Fear, Neuse, and Tar. Floyd brought floods, high winds, tornadoes, and a tidal surge, which caused damages across eastern North Carolina. The floods isolated communities and resulted in people having to flee from their homes. Over 56,000 houses were damaged, 17,000 houses became uninhabitable, and 7,000 houses were destroyed by floods in North Carolina. Fifty-two people died in the disaster. In response to the needs of the affected communities, "Health Works After the Flood" was founded by investigators engaging in a health promotion study in five counties: Duplin, Lenoir, Pender, Sampson, and Wayne. Through qualitative research, they examined the social determinants of community preparedness, response, and recovery from the disaster. The team developed locally specific, "homegrown," contextualized measures of social capital, social cohesion, and collective efficacy. The residents in the five counties were relatively poor, and a high

percentage were minorities. In relation to disaster preparedness, those with lower socioeconomic status and of a different ethnicity were considered more vulnerable. People with lower socioeconomic status were more vulnerable because they lived on lower ground where the risk for flooding was higher. In the disaster preparedness phase, local authorities and the media provided sufficient information to some county residents of potentially severe flooding; however, other residents had insufficient information, especially the Spanish-speaking minority population. In this situation, the authors suggested the possibility that people with abundant social networks might be less vulnerable to a disaster because they can easily gain access to resources. Additionally, their focus group interview revealed that in the immediate response and relief phases of the flood, people recognized the value of "neighbors helping neighbors" and there were a lot of collaborative actions taking place in the community. Business, community, and religious organizations also supported flood victims, although there were exceptions. However, most of these "altruistic communities" had not progressed to the recovery phase.

Gujarat Earthquake in India, 2001

Following an earthquake in Gujarat, India, in 2001, Nakagawa and Shaw (2004) examined their previous theory regarding the Hanshin-Awaji earthquake. In their results, social capital partially accounted for the recovery rate and residents' satisfaction with the plans for the new town. This episode also supports the importance of social capital in communities before disasters occur, in terms of improving resilience, which reduces the risks associated with disasters and promotes recovery after a crisis.

Hurricane Katrina in the United States, 2005

As mentioned in the case of the Japan earthquake (Nakagawa & Shaw, 2004), government officials' top-down efforts to respond to a large disaster are often limited to immediately after a disaster; therefore, a bottom-up approach, which links to social capital, is crucial when responding to a disaster (Allen, 2006; Baker & Refsgaard, 2007; Castleden et al., 2011). Baker and Refsgaard (2007) reported on government institutions' failures and the important roles of nongovernmental voluntary networks soon after Hurricane Katrina hit the United States in August 2005. Katrina, with sustained winds of 140 mph, caused 1,053 deaths in Louisiana and 228 deaths in Mississippi. Nongovernmental rescue groups arrived in stricken areas before the Federal Emergency Management Agency (FEMA). When official aid failed to arrive, nongovernmental institutions improved or built other delivery systems. In relation to financial aid and materials in the ten weeks following Katrina, voluntary nongovernmental networks offered key sources; $2.6 billion was donated, which was about two-thirds of FEMA's contribution during the first six weeks. Volunteers also assisted with rebuilding the city. For example, within a week of the hurricane, the Common Ground Collective, consisting of more than 10,000 volunteers, began digging out the Lower Ninth Ward with plans to rebuild it; this was one of the

hardest hit and most neglected areas in New Orleans. Later, the organization became involved in representing residents in government dealings and physical planning, as well as building resilience through the development of social capital (Baker & Refsgaard, 2007).

A qualitative study by Hawkins and Maurer (2010) examined the utilization of social capital to help victims of Hurricane Katrina relocate and restore individual houses and communities. They measured bonding, bridging, and linking social capital. Bonding social capital was defined as giving and receiving help from the network within racial and socioeconomic lines. Bridging social capital involved creating capital that went across lines. Linking social capital was connected to other communities and organizations outside New Orleans. Results showed that bonding social capital, or close networks, was important for immediate support, but bridging and linking social capital offered pathways to longer-term survival and wider neighborhood and community recovery. Those with low incomes particularly relied on all levels of social capital for individual, family, and community survival (Hawkins & Maurer, 2010).

7.1.5 Mechanisms Linking Social Capital to the Impact from a Disaster

Social capital has been defined in at least two different ways: (a) the network-based definition—"the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationship[s] of mutual acquaintance or recognition" (Bourdieu, 1986) and (b) the cohesion-based definition—"features of social organization, such as trust, norms and networks that can improve the efficiency of society by facilitating coordinated actions" (Putnam, 1993). Whichever way it is defined, the resources obtained from social capital mitigate the impact of a disaster through several mechanisms.

In the phase of disaster preparation, studies showed that communities with many civic organizations (higher stock of social capital) were more highly prepared for disasters through the civic organizations (Buckland & Rahman, 1999; Murphy, 2007). These results suggested that social capital promoted the establishment of formal networks in the community prior to the disaster, which worked as good channels for combining disaster response activities both during and after the disaster. From a political perspective, social capital may also be useful for disaster preparedness planning. Bihari and Ryan (2012) showed the association between community social capital, measured by various indices, and wildfire preparedness. They contend that planners can take advantage of social capital to increase citizen participation in disaster preparation (Bihari & Ryan, 2012).

Social capital also helps people in the response and relief phases, during and immediately after the disaster. In these phases, government officials' top-down efforts are often limited; therefore, the bottom-up approach, which arises from the community, is important. Social capital improves such mutual help as it results in

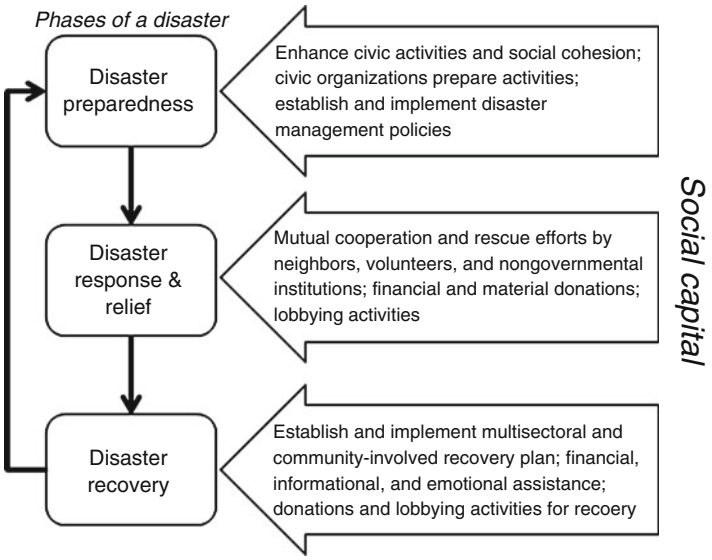

Fig. 7.2 Mechanisms that link social capital to various phases of a disaster

"neighbors helping neighbors" to survive a disaster (Baker & Refsgaard, 2007; Moore et al., 2004; Nakagawa & Shaw, 2004). In relation to the dimension of social capital, bonding social capital, or close networks, was important for immediate support, but bridging and linking social capital offered support for longer-term survival and wider neighborhood and community recovery (Hawkins & Maurer, 2010). Social capital also increases financial and material donations (Baker & Refsgaard, 2007) as well as lobbying activities for disaster response (Nakagawa & Shaw, 2004).

In the recovery phase of a disaster, Aldrich (2011) has posited three mechanisms that result in communities with greater social capital stock recovering more quickly from a disaster: (a) social connections can serve as "informal insurance," allowing victims to draw upon preexisting support networks for financial, informational, and emotional assistance; (b) better-connected communities are more effective at mobilizing residents to voice their demands and extract resources from authorities (referred to as "collective efficacy"); and (c) cohesive communities raise the cost of "exit" from embedded networks, thereby increasing the probability that residents will be invested in returning to their communities to work together toward reconstruction. In fact, varied emotional assistance was observed in a case study that reported the benefits of social capital for women survivors of an earthquake in Turkey in 1997. Social capital and emergent civic networks not only helped the women overcome the psychological impact of the disaster but also empowered them and helped them overcome the "stigma" (hesitation) to accept public assistance in Gölcük (Ganapati, 2012).

Figure 7.2 shows the mechanisms that link social capital to various phases of a disaster.

7.1.6 The Dark Side of Social Capital in Disaster Settings

In contrast to the beneficial effects of social capital, the dark side of social capital has also been reported (Putnam, 2000). In disaster settings, negative effects of social capital have been suggested (Buckland & Rahman, 1999; Elliott, Haney, & Sams-Abiodun, 2010).

Elliott et al. (2010) reported that inequalities in social capital widen during periods after disasters. Inequalities caused less effectiveness of social safety nets for disadvantaged populations. Another study suggested that discrimination, considered to be linked to lower levels of social capital, caused unfair distribution of post-disaster aid (Aldrich, 2010). As mentioned in the previous section, although Buckland and Rahman (1999) showed the beneficial effects of social capital in disaster preparedness and recovery, they also reported that higher levels of social capital lead to greater conflicts in decision making as a result of a flatter social structure.

7.2 Disasters, Social Capital, and Health

Disasters cause fatalities (Center for Research on the Epidemiology of Disasters, 2012; Knight, 2011; Pradhan et al., 2007) and affect the physical and mental health of populations (Hussain et al., 2011; Neria et al., 2008; Perlman et al., 2011; Reacher et al., 2004; Thienkrua et al., 2006; van Griensven et al., 2006; Yzermans et al., 2005). In particular, a substantial number of studies have reported serious impacts of disasters on the mental health of surviving victims (Neria et al., 2008; Perlman et al., 2011; Thienkrua et al., 2006; van Griensven et al., 2006). The prevalence of posttraumatic stress disorder (PTSD) after man-made disasters is often higher than it is after natural disasters (Neria et al., 2008). In addition to the direct consequences of the disasters themselves, disasters affect health in the long term. Disasters destroy not only physical environments but social networks and relationships in communities as well. Such loss of community causes secondary trauma (Long & Wong, 2012). Forced relocation following the destruction of a community by disaster also increases health problems (Uscher-Pines, 2009; Yzermans et al., 2005). Disaster also affects chronic illnesses by interrupting access to healthcare (Jhung et al., 2007), and lack of access to routine healthcare causes mortality after a disaster (Spiegel et al., 2002).

Social capital potentially promotes health following disasters. The following requirements to protect and recover mental health in the short and mid terms after disasters were reviewed by experts: (1) a sense of safety, (2) a sense of calm, (3) a sense of self- and community efficacy, (4) connectedness, and (5) hope (Hobfoll et al., 2007). Connectedness is linked to social capital. Additionally, regardless of whether there is a disaster or not, social capital is considered to promote mental health by reducing psychological distress (Kawachi & Berkman, 2000; Phongsavan,

Chey, Bauman, Brooks, & Silove, 2006). Reviews of literature suggest a protective effect of individual social capital on mental health (De Silva, McKenzie, Harpham, & Huttly, 2005), although the association is less consistent in neighborhood social capital (Almedom & Glandon, 2008; Kim, 2008). In addition to these psychosocial processes, social capital encourages reconstruction in disaster-affected communities (Aghabakhshi & Gregor, 2007; Aldrich, 2012; Buckland & Rahman, 1999; Moore et al., 2004; Nakagawa & Shaw, 2004) and may help reduce the long-term health impact caused by a disaster and promote the mental and physical health of the population.

7.2.1 Findings Regarding Social Capital and Health in Disaster Settings

In this section, we review literature on social capital and health in disaster settings. Literature that examined the associations between social capital and health after disasters was sought using PubMed issues published through August 20, 2012. Terms used were "social capital" along with one of the following: disaster, earthquake, tsunami, hurricane, flood, fire, rain, or heat wave. The search returned 34 unique abstracts; among these, there were only six epidemiological studies from four disasters. All six of these pieces of literature were included in the review (Ali et al., 2012; Beaudoin, 2007, 2011; Beiser et al., 2010; Wind et al., 2011; Wind & Komproe, 2012). Five studies investigated individual social capital and there was a multilevel study. The indicators of social capital were different in each study. The outcomes used were PTSD (Ali et al., 2012; Beiser et al., 2010; Wind et al., 2011; Wind & Komproe, 2012), anxiety (Wind et al., 2011), depression (Beaudoin, 2007; Wind et al., 2011), and smoking and alcohol consumption (Beaudoin, 2011). In the following section, we provide details of these six studies from the four disasters. In addition, Table 7.1 shows the summary of these studies.

Human-Initiated Disaster (Severe Criminal Violence) in Nigeria, 1995

The association between social capital and PTSD was examined among the survivors of a human-initiated disaster (severe criminal violence) in the Niger Delta region of Nigeria in 1995. Beiser et al. (2010) conducted a cross-sectional study in 2002 that included 45 adult residents from a village affected by a human-initiated disaster and 55 from a non-affected village. PTSD was diagnosed using the PTSD module of the WHO Composite International Diagnostic Interview (WHO, 1997). Individual social capital was conceptualized as being comprised of the following factors: economic security, feeling safe, sense of moral order, and social support. Logistic regression models revealed that lower levels of social capital were significantly associated with a higher probability of PTSD after adjustment for residence, exposure, and age. The results of this study suggested that attention should be paid to both individual and social wounds caused by violence and abuse.

Table 7.1 Summary of the studies on social capital and health after disasters

Author	Country	Setting	Year	Study subjects	Indicator of social capital	Outcome	Analysis	Findings
Wind and Komproe (2012)	UK	Community, flood	2009	Community-dwelling males and females, all ages ($n=232$) in Morpeth	Community (postcode area) structural social capital (aggregated eight items, frequency of interaction between community members) and community cognitive social capital (aggregated seven items, trust, mutual help, reciprocity) measured by SA-SCAT	PTSD (PTSD Checklist—Civilian Version)	Multilevel structural equation modeling	Community social capital was indirectly salutary for individual PTSD. Higher structural social capital was associated with higher cognitive social capital and collective efficacy. In these salutary social contexts, individuals employed fewer coping strategies and less social support, which decreased PTSD
Ali et al. (2012)	Pakistan	Community, earthquake	2008	Earthquake survivors aged 18 years or older lived in three districts ($n=300$)	Individual social capital by Onyx and Bullen (2000)	PTSD (Davidson Trauma Scale)	Logistic regression	High social capital was significantly associated with lower odds for having PTSD, adjusting for sociodemographic characteristics

Wind et al. (2011)	UK	Community, flood	2009	Community-dwelling males and females, all ages ($n=232$) in Morpeth	Individual structural social capital (eight items, frequency of interaction between community members) and individual cognitive social capital (seven items, trust, mutual help, reciprocity) measured by SA-SCAT	Anxiety, depression (Hopkins Symptom Checklist-25), and PTSD (PTSD Checklist –Civilian Version)	Linear regression and path analysis	High individual cognitive social capital was significantly associated with lower risks for three mental health outcomes. However, high individual structural social capital was significantly associated with a higher risk of anxiety after being adjusted for sociodemographic characteristics, individual appraisal processes, social support, and coping behaviors
Beaudoin (2011)	USA	Community, hurricane	Before hurricane: 2004–2005 Follow-up: 2006	African-American adults (2004, $n=1,867$; 2005, $n=879$; 2006 June/July, $n=500$; September, $n=500$)	Individual neighborliness (three items, mutual help, social participation)	Smoking and alcohol consumption	Logistic regression and OLS regression	High social capital increased alcohol consumption even after being adjusted for sociodemographic characteristics, disaster exposure, smoking, PTSD, news attention, and social support. There was no significant association between smoking and social capital

(continued)

Table 7.1 (continued)

Author	Country	Setting	Year	Study subjects	Indicator of social capital	Outcome	Analysis	Findings
Beiser et al. (2010)	Nigeria	Community, severe criminal violence	2002	45 adult residents from a village affected by a human-initiated disaster and 55 from a non-affected village	Individual social capital (economic security, feeling safe, sense of moral order, and social support)	PTSD	Logistic regression	Lower levels of social capital were significantly associated with a higher probability of suffering from PTSD, after adjusting for residence, exposure, and age
Beaudoin (2007)	USA	Shelter, hurricane	2005	57 shelter residential adults	Individual social interactions before and after the hurricane	Depression/ illness and injury	Logistic regression	Pre- and post-hurricane positive social interactions were associated with lower odds for depression after adjusting for sociodemographic characteristics. Post-hurricane negative social interactions were associated with higher odds for depression. There was no significant association between illness and injury and social interactions

Earthquake in Pakistan, 2005

In October 2005, a 7.6-magnitude earthquake occurred in Pakistan, with tremors being felt across regions from Kabul to Delhi, claiming almost 87,000 lives. Ali et al. (2012) conducted a cross-sectional study that explored protective factors against PTSD in order to generate suggestions for future interventions. Three hundred earthquake survivors aged 18 years or older from three districts were enrolled. An interview survey using a semi-structured questionnaire was conducted from April to June 2008. PTSD was used as the observed outcome, and the Davidson Trauma Scale was applied for this measurement. Social capital was measured via Onyx and Bullen's validated questionnaire (Onyx & Bullen, 2000). Logistic regression models were applied to calculate the odds ratio for having PTSD. Information about age, gender, family head status, employment status, current civil status, living place, income, whether respondents were religious, whether they prayed regularly, social capital, past medication history, life impairments, educational status, and the degree of exposure to the earthquake were included in the model. Their analysis showed that social capital was the strongest predictor of PTSD, followed by being head of a family, having a low income, and being religious minded. Individuals with abundant social capital have a lower risk of suffering from PTSD. In contrast, females, the elderly, unmarried persons, heads of families, the unemployed, persons with low incomes, and persons living in temporary housing were associated with a higher risk of PTSD. The authors suggested that efforts to enhance the social capital of survivors' surroundings might promote their mental health by efficiently helping to enhance their coping abilities and lives in general.

Hurricane Katrina in the United States, 2005

Hurricane Katrina hit the United States in August 2005. Beaudoin (2011) used cross-sectional ($N = 1{,}867$ in 2004, $N = 879$ in 2005) and panel survey data ($N = 500$ in June/July 2006, $N = 500$ in September 2006) from African-American adults in New Orleans, Louisiana, to determine trends regarding addictive behavior and their predictors. Alcohol consumption and cigarette smoking were used as outcomes. Social capital-related measurements including neighborliness such as reciprocity and participation (Beaudoin, 2009) and the outcome of social capital (provided social support) (Piferi & Lawler, 2006) were used. High levels of an individual social capital-related measure (neighborliness) corresponded with an increase in alcohol consumption even after adjustment for age, gender, education, household income, disaster exposure, smoking, PTSD, news attention, and social support. There was no significant association between smoking and neighborliness. Providing support was inversely associated with smoking. There was a significant, positive interaction between PTSD and neighborliness for the dependent variable of alcohol consumption. There were complex associations between addictive behaviors and social capital-related measurements. The author insisted that future research using other measurements of social capital was needed.

Beaudoin (2007) also examined the associations between social capital, depression, illness, and injury after Hurricane Katrina. A semistructured interview survey was

conducted with 57 shelter residents between four and six weeks after the hurricane. Self-reported responses to questions were used to measure two outcomes: depression, and illness and injury. Illness and injury were combined into an overall index. Social interactions before and after the disaster were measured and used as a variable representing social capital. Logistic regression analysis was used to estimate the odds of having health problems. Pre- and post-hurricane positive social interactions were associated with lower odds of having depression after adjustment for race/ethnicity, age, gender, income, and education. Post-hurricane negative social interactions were associated with higher odds of depression. Both post-hurricane positive and negative social interactions showed stronger associations with depression than pre-hurricane social interactions did. There was no significant association between the factor of illness and injury and measured social interactions. This study suggested the importance of social capital in determining mental health outcomes, regardless of race/ethnicity, income, and education.

Flood in Morpeth in the United Kingdom, 2008

In September 2008, the worst flood since 1961 struck Morpeth, Northumberland County, UK. There were two reports on the cross-sectional study, which consisted of face-to-face interviews with 232 flood-affected respondents in August 2009 (Wind et al., 2011; Wind & Komproe, 2012). The first study used anxiety and depression, measured by the Hopkins Symptom Checklist-25, and PTSD, assessed through the PTSD Checklist—Civilian Version (PCL-C), as the mental health outcomes observed in their study (Wind et al., 2011). Both structural and cognitive social capital were measured using the Short Social Capital Assessment Tool (SA-SCAT) (De Silva, Huttly, Harpham, & Kenward, 2007). Sequence of linear regression models, which accounted for the "unequal proximity problem" (Weitkunat & Wildner, 2002), revealed that high individual cognitive social capital was significantly associated with lower risks of three mental health outcomes after adjustment for gender, age, education, and disaster-related factors (including social support). However, high individual structural social capital was significantly associated with a higher risk of anxiety (but not with PTSD or depression) after adjustment for sociodemographic characteristics, individual appraisal processes, social support, and coping behaviors. This study suggested the possibility that psychosocial intervention could foster the development of cognitive social capital to reduce mental health problems.

In the second study, the association between community social capital and PTSD was examined by using multilevel structural equation modeling (Wind & Komproe, 2012). Community was defined by postcode area. Their analyses showed that community social capital was indirectly salutary for individual PTSD. Higher structural social capital was associated with higher cognitive social capital and collective efficacy. In these salutary social contexts, individuals employed fewer coping strategies and sought less social support, which decreased PTSD. These results suggest that individuals living in communities with greater social capital suffer less from PTSD. Disaster victims in communities with high social capital rely on the social context to address disaster-related demands rather than relying on individual resources, such as coping strategies and social support.

7.3 Further Study on Disaster and Health

Disasters alter social and physical environments where people live. Disaster research is important to extract implications to promote recovery from disasters and prepare for future disasters. One problem with studies on disaster and health is that there are fewer studies on physical health compared to mental health studies that are rich in information, especially regarding the PTSD that surfaces immediately after disasters (Neria et al., 2008; Uscher-Pines, 2009). Disasters destroy healthcare systems as well as communities, which causes a long-term impact on health, affects control of chronic illnesses, and increases mortality (Jhung et al., 2007; Spiegel et al., 2002). Studies on physical health and long-term observations on physical and mental health in the recovery phase of disasters are needed.

Another problem related to disaster research is the study design. Because disasters cause tremendous changes in social and physical environments, disaster research has the possibility to determine the effect of communities on the population health. However, it is difficult to infer causality between the characteristics of the community and health because (a) there is an absence of an appropriate control group (those who were unexposed to the disaster) in order to draw appropriate counterfactual comparisons and (b) there is an absence of information on pre-disaster levels of health and variable confounders, or the use of retrospective recall, which can be biased (Buttenheim, 2010). A notable exception is the Study of the Tsunami Aftermath and Recovery (STAR) following the December 26, 2004, Indian Ocean tsunami (Frankenberg et al., 2008). In that study, residents in Indonesia had been interviewed ten months before the tsunami as part of the National Socioeconomic Survey (SUSENAS) conducted by Statistics Indonesia. A follow-up survey was conducted during 2005–2006, in which investigators recontacted over 25,000 individuals who had participated in the original survey. The study found that symptoms of PTSD were highest among respondents from the most heavily damaged areas and among those who suffered loss of kin and property damage (Frankenberg et al., 2008). There is another solution to obtaining data before a disaster. For example, Yzermans et al. (2005) used the electronic medical records of general practitioners before and after a disaster. Such studies can avoid recall bias, even though available data may be limited.

7.4 Concluding Remarks

In this chapter, the roles of social capital in disaster settings were explained. In addition, studies examining the associations between social capital and health status after disasters were reviewed.

Although disasters are common and suddenly damage communities and the health of population, damages are mitigable through the appropriate preparation of, response to, and recovery from disasters. Recent research has revealed that social capital is a key element for establishing resilient communities. In communities with

an affluent stock of social capital, people participate in social activities, trust and help each other, and enjoy their social networks. Government organizations cooperate with other sectors and involve residents in implementing disaster preparation policies. In such communities, people can effectively deal with the impact of disasters using resources that arise from rich social capital. After disasters, social capital in communities promotes the recovery of people and the community. Financial, informational, and emotional support is provided among neighbors. Demands of residents reach governmental organizations relatively easily. A community-involved recovery plan will be implemented.

Various sociological studies have focused on the positive roles social capital plays in disaster preparedness, response, recovery, and resilience. In contrast, there have been fewer epidemiological studies examining the effects of social capital on health after disasters. In addition, previous epidemiological studies did not capture all of the roles of social capital and their effects on various health outcomes. Future studies, such as multilevel studies, panel studies, and natural experiment studies using pre- and post-disaster health and social status, are needed in order to determine the beneficial effects of social capital in terms of health resilience to disasters.

References

Aghabakhshi, H., & Gregor, C. (2007). Learning the lessons of Bam: The role of social capital. *International Social Work, 50*(3), 347–356.

Ahern, J., & Galea, S. (2006). Social context and depression after a disaster: The role of income inequality. *Journal of Epidemiology and Community Health, 60*(9), 766–770.

Aldrich, D. P. (2010). Separate and unequal: Post-tsunami aid distribution in Southern India. *Social Science Quarterly, 91*(5), 1369–1389.

Aldrich, D. P. (2011). The power of people: Social capital's role in recovery from the 1995 Kobe earthquake. *Natural Hazards, 56*(3), 595–611.

Aldrich, D. P. (2012). Social, not physical, infrastructure: The critical role of civil society after the 1923 Tokyo earthquake. *Disasters, 36*(3), 398–419.

Ali, M., Farooq, N., Bhatti, M. A., & Kuroiwa, C. (2012). Assessment of prevalence and determinants of posttraumatic stress disorder in survivors of earthquake in Pakistan using Davidson Trauma Scale. *Journal of Affective Disorders, 136*(3), 238–243.

Allen, K. M. (2006). Community-based disaster preparedness and climate adaptation: Local capacity-building in the Philippines. *Disasters, 30*(1), 81–101.

Almedom, A., & Glandon, D. (2008). Social capital and mental health. In I. Kawachi, S. V. Subramanian, & D. Kim (Eds.), *Social capital and health* (pp. 191–214). New York: Springer.

Appel, A. (2005). After Katrina: Tracking the toxic flood. *Nature, 437*(7058), 462.

Arnold, J. L. (2002). Disaster medicine in the 21st century: Future hazards, vulnerabilities, and risk. *Prehospital and Disaster Medicine, 17*(1), 3–11.

Baker, D., & Refsgaard, K. (2007). Institutional development and scale matching in disaster response management. *Ecological Economics, 63*(2–3), 331–343.

Beaudoin, C. E. (2007). News, social capital and health in the context of Katrina. *Journal of Health Care for the Poor and Underserved, 18*(2), 418–430.

Beaudoin, C. E. (2009). Bonding and bridging neighborliness: An individual-level study in the context of health. *Social Science & Medicine, 68*(12), 2129–2136.

Beaudoin, C. E. (2011). Hurricane Katrina: Addictive behavior trends and predictors. *Public Health Reports, 126*(3), 400–409.
Beiser, M., Wiwa, O., & Adebajo, S. (2010). Human-initiated disaster, social disorganization and post-traumatic stress disorder above Nigeria's oil basins. *Social Science & Medicine, 71*(2), 221–227.
Bihari, M., & Ryan, R. (2012). Influence of social capital on community preparedness for wildfires. *Landscape and Urban Planning, 106*(3), 253–261.
Bourdieu, P. (1986). The forms of capital. In J. Richardson (Ed.), *The handbook of theory and research for the sociology of education* (pp. 241–258). New York: Greenwood.
Briere, J., & Elliott, D. (2000). Prevalence, characteristics, and long-term sequelae of natural disaster exposure in the general population. *Journal of Traumatic Stress, 13*(4), 661–679.
Brouwer, R., & Nhassengo, J. (2006). About bridges and bonds: Community responses to the 2000 floods in Mabalane district, Mozambique. *Disasters, 30*(2), 234–255.
Buckland, J., & Rahman, M. (1999). Community-based disaster management during the 1997 red river flood in Canada. *Disasters, 23*(2), 174–191.
Buttenheim, A. (2010). Impact evaluation in the post-disaster setting: A case study of the 2005 Pakistan earthquake. *Journal of Development Effectiveness, 2*(2), 197–227.
Castleden, M., McKee, M., Murray, V., & Leonardi, G. (2011). Resilience thinking in health protection. *Journal of Public Health, 33*(3), 369–377.
Center for Research on the Epidemiology of Disasters. (2012). *EM-DAT: The OFDA/CRED International Disaster Database*. Brussels: Université Catholique de Louvain. http://www.emdat.be.
Cox, R. S., & Perry, K. M. (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*(3–4), 395–411.
De Silva, M. J., Huttly, S. R., Harpham, T., & Kenward, M. G. (2007). Social capital and mental health: A comparative analysis of four low income countries. *Social Science & Medicine, 64*(1), 5–20.
De Silva, M. J., McKenzie, K., Harpham, T., & Huttly, S. R. (2005). Social capital and mental illness: A systematic review. *Journal of Epidemiology and Community Health, 59*(8), 619–627.
Dynes, R. (2005). *Community social capital as the primary basis for resilience*. University of Delaware Disaster, Research Center. Preliminary Paper No.344.
Ebi, K. L. (2011). Resilience to the health risks of extreme weather events in a changing climate in the United States. *International Journal of Environmental Research and Public Health, 8*(12), 4582–4595.
Elliott, J. R., Haney, T. J., & Sams-Abiodun, P. (2010). Limits to social capital: Comparing network assistance in two New Orleans neighborhoods devastated by Hurricane Katrina. *The Sociological Quarterly, 51*(4), 624–648.
Frankenberg, E., Friedman, J., Gillespie, T., Ingwersen, N., Pynoos, R., Rifai, I. U., et al. (2008). Mental health in Sumatra after the tsunami. *American Journal of Public Health, 98*(9), 1671–1677.
Ganapati, N. E. (2012). In good company: Why social capital matters for women during disaster recovery. *Public Administration Review, 72*(3), 419–427.
Hawkins, R. L., & Maurer, K. (2010). Bonding, bridging and linking: How social capital operated in New Orleans following Hurricane Katrina. *British Journal of Social Work, 40*(6), 1777–1793.
Hobfoll, S. E., Watson, P., Bell, C. C., Bryant, R. A., Brymer, M. J., Friedman, M. J., et al. (2007). Five essential elements of immediate and mid-term mass trauma intervention: Empirical evidence. *Psychiatry, 70*(4), 283–315. discussion 316–269.
Hussain, A., Weisaeth, L., & Heir, T. (2011). Psychiatric disorders and functional impairment among disaster victims after exposure to a natural disaster: A population based study. *Journal of Affective Disorders, 128*(1–2), 135–141.
Jhung, M. A., Shehab, N., Rohr-Allegrini, C., Pollock, D. A., Sanchez, R., Guerra, F., et al. (2007). Chronic disease and disasters medication demands of Hurricane Katrina evacuees. *American Journal of Preventive Medicine, 33*(3), 207–210.

Kawachi, I., & Berkman, L. (2000). Social cohesion, social capital, and health. In L. Berkman & I. Kawachi (Eds.), *Social epidemiology* (pp. 174–190). New York: Oxford University Press.

Kim, D. (2008). Blues from the neighborhood? Neighborhood characteristics and depression. *Epidemiologic Reviews, 30*, 101–117.

Knight, L. (Ed.). (2011). *World disasters report*. Geneva: International Federation of Red Cross and Red Crescent Societies.

Koh, H. K., Elqura, L. J., Judge, C. M., & Stoto, M. A. (2008). Regionalization of local public health systems in the era of preparedness. *Annual Review of Public Health, 29*, 205–218.

Kohl, P. A., O'Rourke, A. P., Schmidman, D. L., Dopkin, W. A., & Birnbaum, M. L. (2005). The Sumatra-Andaman earthquake and tsunami of 2004: The hazards, events, and damage. *Prehospital and Disaster Medicine, 20*(6), 355–363.

Levac, J., Toal-Sullivan, D., & O'Sullivan, T. L. (2012). Household emergency preparedness: A literature review. *Journal of Community Health, 37*(3), 725–733.

Limpakarnjanarat, K., & Ofrin, R. H. (2009). Planning for and responding to public health needs in emergencies and disasters. In R. Detels, R. Beaglehole, M. A. Lansang, & M. Gulliford (Eds.), *Oxford textbook of public health* (pp. 1697–1706). Oxford: Oxford University Press.

Long, D., & Wong, Y. L. (2012). Time bound: The timescape of secondary trauma of the surviving teachers of the wenchuan earthquake. *The American Journal of Orthopsychiatry, 82*(2), 241–250.

Moore, S., Daniel, M., Linnan, L., Campbell, M., Benedict, S., & Meier, A. (2004). After Hurricane Floyd passed: Investigating the social determinants of disaster preparedness and recovery. *Family & Community Health, 27*(3), 204–217.

Murosaki, Y. (2007). The Great Hanshin earthquake and fire. *Journal of Disaster Research, 2*(4), 298–302.

Murphy, B. L. (2007). Locating social capital in resilient community-level emergency management. *Natural Hazards, 41*(2), 297–315.

Nakagawa, Y., & Shaw, R. (2004). Social capital: A missing link to disaster recovery. *International Journal of Mass Emergencies and Disasters, 22*(1), 5–34.

Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine, 38*(4), 467–480.

Noji, E. K. (2005). Public health in the aftermath of disasters. *British Medical Journal, 330*(7504), 1379–1381.

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*(1–2), 127–150.

Onyx, J., & Bullen, P. (2000). Measuring social capital in five communities. *The Journal of Applied Behavioral Science, 36*(1), 23–42.

Perlman, S. E., Friedman, S., Galea, S., Nair, H. P., Eros-Sarnyai, M., Stellman, S. D., et al. (2011). Short-term and medium-term health effects of 9/11. *Lancet, 378*(9794), 925–934.

Phongsavan, P., Chey, T., Bauman, A., Brooks, R., & Silove, D. (2006). Social capital, socio-economic status and psychological distress among Australian adults. *Social Science & Medicine, 63*(10), 2546–2561.

Piferi, R. L., & Lawler, K. A. (2006). Social support and ambulatory blood pressure: An examination of both receiving and giving. *International Journal of Psychophysiology, 62*(2), 328–336.

Pradhan, E. K., West, K. P., Jr., Katz, J., LeClerq, S. C., Khatry, S. K., & Shrestha, S. R. (2007). Risk of flood-related mortality in Nepal. *Disasters, 31*(1), 57–70.

Putnam, R. D. (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton: Princeton University Press.

Putnam, R. D. (2000). *The dark side of social capital. Bowling alone*. New York: Simon & Schuster.

Ramakrishnan, D., Ghosh, S. K., Raja, V. K. M., Chandran, R. V., & Jeyram, A. (2005). Trails of the killer tsunami: A preliminary assessment using satellite remote sensing technique. *Current Science, 88*(5), 709–711.

Reacher, M., McKenzie, K., Lane, C., Nichols, T., Kedge, I., Iversen, A., et al. (2004). Health impacts of flooding in Lewes: A comparison of reported gastrointestinal and other illness and mental health in flooded and non-flooded households. *Communicable Disease and Public Health, 7*(1), 39–46.

Rutherford, W. H., & de Boer, J. (1983). The definition and classification of disasters. *Injury, 15*(1), 10–12.

Spiegel, P., Sheik, M., Gotway-Crawford, C., & Salama, P. (2002). Health programmes and policies associated with decreased mortality in displaced people in postemergency phase camps: A retrospective study. *Lancet, 360*(9349), 1927–1934.

Thienkrua, W., Cardozo, B. L., Chakkraband, M. L., Guadamuz, T. E., Pengjuntr, W., Tantipiwatanaskul, P., et al. (2006). Symptoms of posttraumatic stress disorder and depression among children in tsunami-affected areas in southern Thailand. *The Journal of the American Medical Association, 296*(5), 549–559.

Uscher-Pines, L. (2009). Health effects of relocation following disaster: A systematic review of the literature. *Disasters, 33*(1), 1–22.

van Griensven, F., Chakkraband, M. L., Thienkrua, W., Pengjuntr, W., Lopes Cardozo, B., Tantipiwatanaskul, P., et al. (2006). Mental health problems among adults in tsunami-affected areas in southern Thailand. *The Journal of the American Medical Association, 296*(5), 537–548.

Weitkunat, R., & Wildner, M. (2002). Exploratory causal modeling in epidemiology: Are all factors created equal? *Journal of Clinical Epidemiology, 55*(5), 436–444.

WHO. (1997). Composite International Diagnostic Interview (CIDI) Geneva: World Health Organization: Division of Mental Health.

Wind, T. R., Fordham, M., & Komproe, I. H. (2011). Social capital and post-disaster mental health. *Global Health Action, 4*.

Wind, T. R., & Komproe, I. H. (2012). The mechanisms that associate community social capital with post-disaster mental health: A multilevel model. *Social Science & Medicine, 75*(9), 1715–1720.

Yzermans, C. J., Donker, G. A., Kerssens, J. J., Dirkzwager, A. J., Soeteman, R. J., & ten Veen, P. M. (2005). Health problems of victims before and after disaster: A longitudinal study in general practice. *International Journal of Epidemiology, 34*(4), 820–826.