

# Appendix C:

## International experiences

### Christchurch earthquakes

Christchurch and the wider Canterbury region in New Zealand were rocked by a magnitude 6.3 earthquake on 22 February 2011, causing the death of 185 people and significant damage to the central business district. The earthquake was an aftershock of a magnitude 7.1 earthquake that occurred on 4 September 2010. It was particularly destructive, occurring along a fault line and in close proximity to the city.

Both, however, were destructive in terms of human life and material costs (Table C.1). More than half of the fatalities were caused by the collapse of the Canterbury Television building. New Zealand Treasury (2013) estimated the capital costs to be \$40 billion, the equivalent of 20% of gross domestic product. In the immediate aftermath, about 60% of the city had no access to water while 80% did not have power (Pedroso, 2013).

Beyond the tangible costs, the social fabric of the local community changed. Mobile phone data indicates that about 55,000 people (or 15% of the population) may have relocated from Christchurch city in the immediate aftermath of the February 2011 earthquake (Canterbury Earthquake Recovery Authority, 2014). Although the overall population change may not seem substantial, this is mainly due to the influx of people working to rebuild the city over subsequent weeks and months. A month later, records indicate that most people had returned to Christchurch.

In the year to June 2011, 8,900 people (or 2.4% of the population) left Christchurch city, followed by another 1.2% over the next year (Canterbury Earthquake Recovery Authority, 2014). It is likely that most of these residents relocated within the wider Canterbury region. This population movement is consistent with that noted following the Queensland floods and the Kobe

earthquake in Japan, where displaced people relocated close to their previous homes to maintain links to their communities, jobs and schools (Love, 2011).

Academic literature strongly emphasises the psychological and mental health impacts of earthquakes on members of the community. The Christchurch Health and Development Study examined the extent of earthquake exposure on a well-studied birth cohort (Fergusson et al., 2014) and found that cohort members who were highly exposed to the earthquakes had mental disorder rates 1.4 times that of cohort members who were not exposed. The study showed a spike in major depression, post-traumatic stress disorder, nicotine dependence and other anxiety disorders.

Another longitudinal study of self-reported health found that since the earthquakes, middle-aged Christchurch residents had mean scores significantly lower than population norms in mental health, vitality and social functioning (Spittlehouse et al., 2014). Rates of major depressive disorders reached 7.5% in earthquake survivors compared to 5.1% and 3.7% in other historical, local and national surveys respectively. Similarly, bipolar disorder prevalence was 2.8% for earthquake survivors compared to 2.2% and 1.4% in other local and national studies respectively.

Similar to experiences in Australia after natural disasters and in the United States following Hurricane Katrina, reported domestic violence increased in the areas affected by the earthquakes, with New Zealand police seeing a 53% increase in domestic violence cases (Parkinson & Zara, 2013).

The literature also notes that invaluable items were removed from the New Zealand Heritage List. Some 195 heritage-listed buildings were destroyed, though the cost of this loss is not yet fully measured (Heritage New Zealand, n.d.).

Table C.1: Economic and social impacts, Canterbury earthquakes

Outcomes	Measure
Fatalities	185 fatalities
Capital costs <sup>1</sup>	\$40 billion
Mental health issues <sup>2</sup>	Based on a well-studied birth cohort, those highly exposed to the earthquake had mental disorder rates 1.4 times higher than those who were not exposed.

Sources: 1. New Zealand Treasury (2013); 2. Fergusson et al. (2014).

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### Hurricane Katrina

Hurricane Katrina struck the Gulf Coast of the United States (US) in August 2005. The storm initially travelled across southern Florida, leaving 100,000 houses without power, before entering the Gulf of Mexico. It then strengthened and passed directly over New Orleans, Louisiana, destroying many lighter buildings and causing extensive damage to other structures. Similar scenes of destruction occurred across Louisiana, as well as in Mississippi and Alabama. The storm surge which followed caused the levee system surrounding New Orleans to break, leading to the rapid and deep flooding of more than 80% of the city.

Hurricane Katrina and its catastrophic storm surge caused widespread damage and devastation. The most significant number of deaths occurred in New Orleans. The estimated death toll from Katrina exceeds 1,300, with approximately 1,067 of those deaths occurring in Louisiana and approximately 230 in Mississippi (FEMA, 2005) (Table C.2). Munich Re estimated the economic losses caused by the hurricane at \$125 billion (US 2005 dollars), of which almost \$62 billion were insured losses (Insurance Information Institute, 2010).

Residents were forced to leave New Orleans because Hurricane Katrina destroyed many workplaces and houses (Vigdor, 2008), causing a near-total evacuation of the city. Census estimates suggest that in the summer of 2006 the city's population was less than half the July 2005 (pre-Katrina) level of 453,000 people. The city was slow to recover, with population growth remaining sluggish for two years after the disaster.

With such large population disruptions, there were notable effects on the city's economy and labour markets. Based on Census data, the city economy suffered from 105,300 job losses in November 2005, compared to what it had been a year earlier (Dolfman et al., 2007). Ten months after the hurricane, job losses had diminished to 92,900 but were still significant. Lost wages over the 10-month period from September 2005 to June 2006 were estimated at \$2.9 billion, with 76% of the loss in the private sector. In addition to job losses, local governments continued to struggle with hiring and retaining qualified employees (French et al., 2008).

Ten years after Hurricane Katrina, there is a wealth of longitudinal data on the social impacts of the disaster, with a particular focus on mental health issues such as post-traumatic stress, psychological distress (Paxson, 2012) and serious emotional disturbance (McLaughlin et al., 2010). Based on a longitudinal survey of low income mothers from New Orleans, Paxson (2012) found that symptoms of post-traumatic stress declined after the hurricane, but still remained high 43–54 months later.

One of the most reported outcomes of Hurricane Katrina was an increase in crime rates, particularly looting and theft, as well as violence, murders and sexual assaults. However, some literature suggests that the incidence and severity of lawlessness was greatly exaggerated (Dwyer & Drew, 2005; Jacob, 2008; Constable, 2008). Jacob (2008), argues that in cases of severe social disruption such as the aftermath of Hurricane Katrina, there are some cases of antisocial behaviour but most people respond positively and generously. Looting did occur in the week following the storm, but the majority of looters were searching for essentials such as food, water and medicine (*The Guardian*, 2015).

Table C.2: Economic and social impacts, Hurricane Katrina

Outcomes	Measure
Fatalities <sup>1</sup>	1,300 fatalities (1,067 deaths in Louisiana)
Insured losses <sup>2</sup>	\$61.9 billion (2005 US dollars)
Community dislocation <sup>3</sup>	Loss of over half the population of New Orleans
Jobs lost <sup>4</sup>	Over-the-year losses of 105,300 jobs in Nov 2005

Source(s): 1. FEMA 2005; 2. Insurance Information Institute (2010); 3. Vigdor 2008; 4. Dolfman et al., 2007