GEOGRAPHIC VARIATION IN EXPOSURE TO THE 2010/11 CANTERBURY EARTHQUAKE SERIES AND ITS IMPLICATIONS ON ADVERSE MENTAL HEALTH OUTCOMES

Research hypothesis

*Christchurch residents more affected by the 2010/11 Canterbury earthquakes and their physical impacts were more likely to show mood and anxiety symptoms when seeking treatment than less affected ones from the same city*

In essence, this research sought to examine a dose-response relationship between exposure to earthquakes and adverse mental health outcomes.

Data sources

**Mood and anxiety information**

Mood and anxiety symptom treatment information, from the New Zealand Ministry of Health's administrative databases (Health tracker), were summarised to a bivariate indicator (treatment/no treatment).

**Exposure variables**

To estimate exposure to earthquake impact, publically available physical earthquake impact information from governmental institutions was accessed including;

- Canterbury Earthquake Recovery Authority (CERA) land classifications,
- Liquefaction and lateral spreading mappings from Tonkin & Taylor,
- Modified Mercalli Intensity (MMI) and Peak Ground Acceleration (PGA) mappings from the United States Geological Service (USGS),
- Community profiles published by the Christchurch City Council (CCC), and
- Earthquake information, as well as ‘felt’ earthquake reports from GeoNet, the official source of geological hazard information for New Zealand.

Thesis results

**Literature review**

- Literature suggests that disaster exposure is an important, and often the most important, risk factor for developing adverse mental health outcomes such as Acute Stress Reaction (ASR), Post-Traumatic Stress Disorder (PTSD), depression or anxiety after a natural hazards disaster, but the geographic variation of disaster exposure and stress-related mental health outcomes has rarely been assessed to relate them to each other.
- There is no golden rule to accurately measure natural disaster exposure although the important role of spatial location has been acknowledged by disaster mental health research.
- Spatial and spatio-temporal analysis techniques have rarely been applied to measure different levels of disaster exposure.
Geographic variation of mood and anxiety symptom treatments in Christchurch after the Canterbury earthquakes

- Post-disaster high rate clusters of mood and anxiety symptom treatments could be found covering the whole eastern areas of Christchurch including the most severely affected parts of the city when comparing annual treatment rates between 2009/10, 2010/11 and 2011/12.
- Living in closer proximity to minor or moderately damaged areas, as well as liquefaction or minor to moderate lateral spreading areas were identified as a risk factors for receiving care or treatment for mood and anxiety symptom treatments.
- Living in areas that experienced higher shaking intensities was also identified as a risk factor for mood and anxiety symptom treatments.
- BUT the identified relationships were only weak, and pre-existing spatial disparities may have biased the results.

Spatio-temporal variation of mood/anxiety symptom treatments

- A possible earthquake exposure effect was identified among Christchurch residents, as treatment for mood and anxiety symptoms significantly increased for Christchurch residents compared to non-Christchurch residents during the earthquake sequence and especially after the catastrophic 2011 earthquake.
- Women, elderly and people with pre-existing mental illnesses were high-risk groups for receiving care or treatment for mood and anxiety symptom treatments.
- In the context of the earthquakes the risks especially increased among Christchurch children and elderly compared to those from the rest of New Zealand.
- Spatial variation of mood and anxiety symptom treatments changed little over time with severely affected eastern communities already exhibiting the highest treatments rates pre-disaster.
- The strongest treatment rate increases surprisingly occurred in the generally less affected northern parts of the city, whereas the lowest increases were found in the most severely affected areas. This may be related to the strong post-disaster mobility activity within the city as a shift from severely affected to less affected parts of the city occurred.
- Distance to earthquake epicentre and socio-economic deprivation were not good predictors for post-disaster mood and anxiety symptom treatments.

The effects of relocation and level of affectedness on mood/anxiety symptom treatments over time

- Movers generally exhibited higher mood and anxiety symptom treatment rates. Moving within the city and temporary relocation were general risk factors compared to staying. But, within city moving showed a protective effect 2 years post-disaster.
- Also, those from the more affluent Port Hills areas had lower risks of receiving care or treatment than similarly affected people on the flat pre-disaster. This suggests an influence of socio-economic status.
- Post-disaster the most affected people on the more affluent hill areas and those on the flat had similar levels of treatment post-disaster. This suggests longer lasting insurance processes for the Port Hills residents may be an issue.
- Out of city movers from affected plain areas showed an increased risk of receiving care or treatment for mood and anxiety symptom treatments 2 years post-disaster compared to those from undamaged areas indicating a trauma-related adverse mental health effect in the long-term.
The effects of various community impacts on mood and anxiety symptom treatments among long-term stayers

- Living in a community with better physical environment and an improvement in the social environment between 2011 and 2012 were protective factors for receiving care or treatment for mood and anxiety symptom treatments post-disaster.
- Counternaturally, risk factors included living in a community with better social environment and community resilience, as well as an improvement in the physical environment. This may be due to the focus of social initiatives and support in communities at the centre of the physical recovery, but also pre-existing spatial patterns of mood and anxiety symptom treatments and treatment-seeking activity.

Research Limitations

- Treatment not disease prevalence has been assessed.
- Health Tracker information only identifies more severe symptoms and not less severe symptoms.
- There was a data driven increase of mood and anxiety symptom treatments in the study period due to an extension of the set of subsidised drugs available.
- No inference to individual disorders or individuals was possible.
- There is a likely treatment-seeking bias as certain demographic groups are more likely to seek treatment, e.g. women compared to men, older adults or those with a pre-existing mental illness.
- Mobility could 'only' be measured on a quarterly basis and depended on treatment-seeking activity (only if a patient uses publically funded health services did the residential address gets updated).

Take-home messages

- Elevated levels of mood and anxiety symptom treatments may be found in more severely affected areas after catastrophic earthquakes, which might have already been the most hazard-prone and socially vulnerable areas pre-disaster.
- High-risk groups for receiving care or treatment for mood and anxiety symptoms include women, children and elderly with pre-existing mental illnesses.
- Mobility plays an important role after natural disasters and may obscure pre-existing spatial patterns of adverse mental health outcomes as less affected areas have been found to experience relatively strong increases in mood and anxiety symptom treatments post-disaster.
- Permanent post-disaster relocatees from affected less affluent areas are especially at risk for mood and anxiety symptom treatments in the long-term after a natural disaster, whereas temporary relocatees are especially at risk in the short-term.
- Social support and community resilience may not be able to mitigate increased levels of mood and anxiety symptom treatments up to 2 years post-disaster.
- In summary, mental health policy should focus on socially vulnerable groups and residents from more affected hazard-prone areas when planning mental health service resources and start building community resilience before a disaster occurs to help communities better cope with post-disaster adversities and resulting mental health effects among their most vulnerable populations.
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References


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