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The effects of spatially varying earthquake impacts on mood and anxiety symptom treatments among long-term Christchurch residents following the 2010/11 Canterbury earthquakes, New Zealand

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ABSTRACT

This study investigates the effects of disruptions to different community environments, community resilience and cumulated felt earthquake intensities on yearly mood and anxiety symptom treatments from the New Zealand Ministry of Health's administrative databases between September 2009 and August 2012. The sample includes 172,284 long-term residents from different Christchurch communities.

Living in a better physical environment was associated with lower mood and anxiety treatment rates after the beginning of the Canterbury earthquake sequence whereas an inverse effect could be found for social community environment and community resilience.

These results may be confounded by pre-existing patterns, as well as intensified treatment-seeking behaviour and intervention programmes in severely affected areas. Nevertheless, the findings indicate that adverse mental health outcomes can be found in communities with worse physical but stronger social environments or community resilience post-disaster. Also, they do not necessarily follow felt intensities since cumulative earthquake intensity did not show a significant effect.

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1. Introduction

Exposure to severe earthquakes and their impacts have often been associated with depression and anxiety reactions (Bonanno et al., 2010). A dose-response relationship is commonly observed, where the degree of exposure determines the symptom severity (Bulut et al., 2005). Examples include the 1988 Armenian earthquake (Armenian et al., 2000, 2002; Goenjian et al., 1994a, 1994b), the 1999 Marmara Earthquake in Turkey (Bal, 2008; Bulut et al., 2005) and the 2008 Wenchuan earthquake in China (Jin et al., 2014; Liu et al., 2010). During the devastating Canterbury earthquake sequence in New Zealand this effect seemed to be prevalent as well but a closer look reveals the complex nature of the phenomenon.

In the initial months after the September 4, 2010 Darfield earthquake and following February 22, 2011 Christchurch event, which caused the most severe disruptions in this long-lasting series of thousands of aftershocks, residents from more affected communities in the severely affected city of Christchurch have been found to show more severe acute stress, depression and anxiety symptoms than those from less affected communities (Dorahy and Kannis-Dymand, 2012; Dorahy et al., 2015). Nearly two years after the start of the earthquake series, a dose-response relationship between individual earthquake exposure, measured by the felt intensity of the earthquakes and social readjustment, and major depression, PTSD, anxiety, as well as levels of distress could still be observed among 35-year old adults (Fergusson et al., 2014, 2015). At the same time, a sample of 50 year old Canterbury residents showed worse post-disaster mental health status compared to pre-earthquake population norms and prevalence rates of mood disorders in historical and national surveys, although the effects were not statistically significant (Spittlehouse et al., 2014). Also, a short-term increase of anxiolytics and sedatives/hypnotics dispensing was observed after the catastrophic Christchurch earthquake. On the other hand, no increase in antidepressant or

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antipsychotic dispensing could be found and reduced acute psychiatric admissions indicated decreasing demand for acute inpatient psychiatric services after this event (Beaglehole et al., 2015a, 2015b). Moreover, Greaves et al. (2015) did not find a dose-response pattern between psychological distress and overall damage in the community among the 267 Christchurch participants from the New Zealand Attitudes and Values Study (NZAVS) in the year of the Christchurch earthquake. However, levels of psychological distress showed a greater drop in the least damaged region compared to the moderately damaged one by late 2012 in the same study. This was not the case when the least damaged region was compared to the most damaged region (Greaves et al., 2015).

These ambiguous results highlight the complexity of the relationship between earthquake exposure and mental health as there are various risk and protective factors that come into play.

Different types of impacts may have different effects on mental health. For example, the traumatic experience of the Christchurch earthquake and its physical impacts resulted in secondary stressors such as living in a damaged environment, economic strain and social disruption. Aftershocks have been reported on many occasions to cause a great deal of stress which threatens recovery (Gawith, 2013; Rowney et al., 2014; Wilson, 2013). On the other hand, research has shown that factors like sense of community (Huang and Wong, 2014; Li et al., 2011), social support and participation (Oyama et al., 2012; Paxson et al., 2012; Watanabe et al., 2004; Zahran et al., 2011; Zhang et al., 2012), individual (Ali et al., 2012), as well as community social capital (Wind and Komproe, 2012) and economic capability (Xu and He, 2012) play an important role in mitigating adverse mental health effects after natural disasters. One reason may be that participation and interaction can foster psychosocial wellbeing by producing a sense of identity, safety and shared values in the community (Huang and Wong, 2014).

Generally, social capital is a complex construct that can be divided into structural social capital, characterised by the actions to build and maintain social relations in a community, and cognitive capital, quantifying the perception of social support, reciprocity, sharing and trust (Harpham et al., 2002). Components of structural social capital, such as connectedness and participation, are often part of disaster recovery plans, for example, the Integrated Recovery Planning Guide concerning the Canterbury earthquakes (The Canterbury District Health Board, 2011). Implementing these concepts should help build cognitive social capital as this has been shown to lead to trust in the community, the employment of less individual psychosocial resources and better psychological wellbeing (Huang and Wong, 2014; Wind et al., 2011; Wind and Komproe, 2012). Feelings of connectedness and unity are also part of social cohesion, which has been positively linked to community resilience (Townshend et al., 2015). It has been defined as “a process linking a set of adaptive capacities to a positive trajectory of functioning and adaption after a disturbance” (Norris et al., 2008, p. 131). Wickes et al. (2015) also reported that economic capability enabling communities to access government support seemed to be important for community resilience in the post-disaster context.

In the context of the Canterbury earthquake sequence, strong individual resilience was found among highly exposed young adults from Christchurch, who often reported positive emotional strength and social bonding as a consequence of the earthquakes (Fergusson et al., 2015). Emotionally stable residents coped well (Osborne and Sibley, 2013) and community bonding and resilience have been reported on many occasions in the first year after the Christchurch earthquake (Gawith, 2013). However, it seems that collective resilience has been lost to some extent. Reasons include the lack of earthquake-related resilience before the events, secondary stressors from the catastrophic February 22, 2011 earthquake, uncertainty from on-going aftershocks and lack of

community involvement in the recovery process and decision-making (Cooper-Cabell, 2013; Gawith, 2013; Wilson, 2013; Thornley et al., 2015).

Disruption to the social, built, economic and natural environments, as well as the uncertainty due to thousands of aftershocks, may have a negative effect on stress-related mental health outcomes of earthquake-affected populations, but it remains unclear what influence each of these variables has and whether or not post-disaster community support and resilience are able to mitigate adverse mental health effects. Therefore, we investigate the effects of varying disruptions to community environments, felt intensities of major earthquakes and their aftershocks, and community resilience on mood and anxiety symptom treatments among affected long-term Christchurch residents. This should help identify what role different community environments, felt earthquake intensities and community resilience play in the incidence and relapse of post-disaster stress-related mental health disorders up to two years after the initial event. This information can then help governmental authorities to better address adverse mental health effects as part of the recovery process.

2. Methods

2.1. Study area

The Christchurch City Council divided the greater city's seven administrative wards into 49 different community profile areas and measured earthquake impacts and resilience at a community level. In our study, we excluded four of these 49 communities, that is, the 'Akaroa', 'Akaroa Harbour', 'Birdlings Flat' and 'Little River' communities, as they are not part of the greater Christchurch urban area and did not allow us to draw large samples.

2.2. Study sample

The study sample was drawn from the Primary Health Organisations (PHO) register, which includes health care providers supporting the provision of primary health care services through general practices. Over 90% of New Zealanders are enrolled as they gain benefits like cheaper doctors' visits and prescription medicines. Every patient has a unique identifier, the National Health Index (NHI), allowing the linkage to mental health information. A quarterly measure for the residential location enabled us to locate and track patients at a meshblock level,¹ which is the small geographic unit defined by Statistics New Zealand. To capture long-term residents bonded to their communities, we only considered those who stayed within the boundary of their community throughout the study period. The latter ranged from September 2009 until the end of August 2012.

This approach excluded any mobility bias. Previous research has shown that movers are more likely to be treated for mood or anxiety symptoms than stayers post-disaster (Hogg et al., 2016), so looking only at stayers, who did not move within the study period overcomes this issue. On the other hand, research also showed that groups with low socio-economic status are disproportionately represented among movers after natural disasters because they are more likely to live in hazard-prone areas and have less political power and resources to defend their properties (Howden-Chapman et al., 2014; Morrow-Jones and Morrow-Jones, 1991). Therefore, it needs to be mentioned that excluding this group from the sample may produce a lower risk subgroup remaining as the

¹ There are 2946 meshblock in the greater Christchurch urban area with on average 117 people per meshblock

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