INVESTIGATING THE RELATIONSHIP BETWEEN DEPRESSION AND

PSYCHOSOCIAL FACTORS AFTER THE CANTERBURY 2011 EARTHQUAKES

IN NEW ZEALAND

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PREFACE

The present study was completed as the first part of a larger research study evaluating responses to the devastating February 22nd 2011 earthquake across 6 different community suburbs. Primary researchers are Associate Professor Martin Dorahy and Dr Eileen Britt. My contribution involved the data collection across two assessments over the last 18 months with participants from two different Christchurch suburbs, and the preparation of this thesis.

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ABSTRACT

Earthquake events can be sudden, stressful, unpredictable, and uncontrollable events in which an individual's internal and external assumptions of their environment may be disrupted. A number of studies have found depression, and other psychological symptoms may be common after natural disasters. They have also found an association between depression, losses and disruptions for survivors. The present study compared depression symptoms in two demographically matched communities differentially affected by the Canterbury (New Zealand) earthquakes. Hypotheses were informed by the theory of learned helplessness (Abramson, Seligman & Teasdale, 1978). A door-to-door survey was conducted in a more physically affected community sample (N=67) and a relatively unaffected community sample (N=67), 4 months after the February 2011 earthquake. Participants were again assessed approximately 10 months after the quake. Measures of depression, acute stress, anxiety, aftershock anxiety, losses, physical disruptions and psychological disruptions were taken. In addition, prior psychological symptoms, medication, alcohol and cigarette use were assessed. Participants in the more affected community reported higher depression scores than the less affected community. Overall, elevated depressive score at time 2 were predicted by depression at time 1, acute stress and anxiety symptoms at time 2, physical disruptions following the quake and psychosocial functioning disruptions at time 2. These results suggest the influence of acute stress, anxiety and disruptions in predicting depression sometime after an earthquake. Supportive interventions directed towards depression, and other psychological symptoms, may prove helpful in psychological adjustment following ongoing disruptive stressors and uncontrollable seismic activity.

CHAPTER ONE

1. INTRODUCTION

1.1. Overview

Natural disasters can have profound effects on individuals and communities (Carr, Lewin, Webster, Hazell, Kenardy, & Carter, 1995). Psychological consequences may be prolonged with enduring post-disaster symptomatology (Norris, Perilla, Reid, Kanisty & Lavizzo, 1999). Stress and post-disaster trauma stemming from natural disasters such as earthquakes can result in communities experiencing psychological difficulties, high levels of distress and uncertainty for extended periods of time (Livanou et al., 2005). The Canterbury earthquakes created significant physical devastation and emotional distress. Thoughts of uncertainty and helplessness, may have contributed to psychological difficulties for survivors.

The City of Christchurch, comprising over 386,000 people, and the wider Canterbury region, experienced a magnitude 7.1 earthquake on 4th September 2010 at 4.35am (Quigley et al., 2010). This event produced no fatalities, but ongoing unpredictable large aftershocks continued in the region. A second major earthquake (magnitude 6.3) hit near the city centre on February 22nd, 2011 at 12.51pm. It was shallow (5 kilometres deep), and was recorded as the most severe earthquake in a major city in New Zealand's history (Reyners, 2011). This event caused widespread devastation, loss of life (185 people died), serious injuries, uninhabitable homes, collapsed buildings, a cordoned off central business district, major loss of resources, businesses, employment, and support services, electricity and sewerage systems, and water contamination throughout many suburbs. There were differences between suburbs in the degree in which they were physically affected by the earthquakes. Significant liquefaction (mixture of silt and water forced upwards during earthquakes) affected the

eastern suburbs in Christchurch severely by damaging land, infrastructures and houses. Liquefaction has occurred repeatedly in these suburbs with subsequent larger aftershocks.

Christchurch has suffered more than 12,000 aftershocks since an initial 7.1 magnitude quake in September, 2010 (see www.geonet.org.nz). Punctuating these persistent shakes have been larger earthquakes, including two on June 13[th]2011, the first measuring 5.8 on the Richter scale, and then shortly after the second at 6.4. These earthquakes caused more damage and resulted in further buildings being earmarked for demolition. In light of this major and ongoing seismic activity, the present study examined mental health functioning, especially with reference to depression and psychosocial factors. Previous studies have examined the association between earthquake-related depression and posttraumatic stress and loss (e.g., Kiliç et al., 2006). The current study utilised a prospective approach to examine predictors of persistent depression following the February 2011 earthquake and subsequent aftershocks.

1.2. Psychological outcomes and natural disasters

Research indicates that individuals differ markedly in their outcomes even when they experience the same traumatic event. Earthquake disasters are sudden and unpredictable events, which can evoke a variety of debilitating psychological consequences for survivors (Bonanno, Brewin, Kaniasty & Greca, 2010; Soames-Job, 2002). A number of studies have shown a range of psychological symptoms resulting from exposure to natural disasters such as earthquakes (Başoğlu, Kiliç, Şalcioğlu, & Livanou, 2004).

The literature on psychological responses to natural disasters suggests that posttraumatic stress disorder (PTSD), depression and anxiety are common symptoms experienced as both short and long term outcomes (Kiliç et al., 2006; Madianos & Evi, 2010; Norris et al., 1999). When earthquakes occur there are disruptions in the aftermath which cause ongoing distress for some communities (Livanou et al., 2005). Recent natural disaster

research found damage to a person's home was positively associated with greater post-disaster distress and increased worry about the future (Bonanno et al., 2002). Studies have found psychological symptom prevalence after earthquakes range between 6% and 67% (Carr et al., 1995; Kiliç et al., 2006; Sharan, Chaudhary, Kavathekar, & Saxena, 1996). Psychological symptoms such as depression and anxiety may be mediated by the severity of earthquakes (Kiliç et al., 2006). The research also found elevated PTSD and mood disorders (Galea et al., 2007).

A study following the El Salvador earthquake in 2001, found acute stress and depression symptoms to be frequent reactions, which overlapped considerably (Sattler, Glower de Alvarado, Blandon de Castro, Van Male, & Vega, 2006). Norris (2005) found that depression was the second most commonly found disorder (after PTSD) among people exposed to natural disasters.

There is a suggestion that PTSD, depression and anxiety do not necessarily occur in isolation, as there appears to be considerable co-morbidity (Goenijian, Steinberg, Najarian, Fairbanks, Tashijian, & Pynoos, 2000). Furthermore, symptoms of one disorder may serve to exacerbate or prolong symptoms of another (Goenjian et al., 2000).

1.3. Depression and natural disasters

Research has shown that stressful life events can play a major role in the development and protraction of depression (Kendler, Karkowkski, & Prescott, 1999; Kessler, 1997; Mazure, 1998). In particular stressful, uncontrollable, and unpredictable events increase the vulnerability of depression-prone individuals to depressive symptoms (Surtees, Miller, Ingham, Kreitman, Rennie, & Sashidharan, 1986). Studies have highlighted that survivors in the wake of disasters often experience intense and function-impairing sadness and depressive thoughts as they try to make sense of the event, and piece things together after the disaster has passed (Bonanno & Kaltman, 2001). Research has found that exposure to disasters has

been associated with increased risk for depression (Galea et al., 2007; Miguel-Tobel et al., 2006) and has been found to be a common psychological response to disasters (Bravo, Rubio-Stipec, Canino, Woodbury, & Ribera, 1990). Such events test the capability of the community and individuals to cope with the massive disruptions in the aftermath of earthquakes (Bödvarsdóttir & Elklit, 2004).

A variety of factors have been found to influence the likelihood that an individual will develop enduring psychological problems in the aftermath of a disaster. Research suggests exposure to disaster events which cause severe physical damage, claim the lives of people, produce extensive loss and grief over a large populated area, may lead survivors to more generalised states of dysphoria and depression (Bonanno, Brewin, Kaniasty, & La Greca, 2010). Whilst there is a prevalence of literature on PTSD and anxiety following disasters (Bonanno et al., 2010) there are relatively few studies of population-based depression following disasters (Norris et al., 1999).

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000), symptoms for Major Depressive Episode (MDE) include depressed or irritable moods; loss of interest or pleasure in usual activities; changes in appetite and weight; disturbed sleep; motor agitation or retardation; fatigue and loss of energy; feelings of worthlessness, self-reproach, or excessive guilt; suicidal thinking and attempts; and difficulty with thinking and concentration. These symptoms can become chronic or recurrent and lead to substantial impairments in an individual's ability to take care of his or her everyday responsibilities. At its worst, depression can lead to suicide.

1.3.1. Prevalence of depression

Depression is a common psychological disorder. In the New Zealand mental health survey *Te Rau Hinengaro* (2006), the lifetime prevalence estimate for major depressive episode, which was the most prevalent mood disorder, was 16.0% for the general population

(Oakley Browne, Wells, Scott, & McGee, 2006). A major depressive episode was the most common mood disorder at 5.7% in a 12-month incidence study (Oakley Browne et al., 2006). In the United States, approximately 6.6% of the general population have a major depressive episode during the course of a year (Kessler et al., 2003).

The prevalence of depression within an entire community affected by mass disaster is still largely unknown (Person, Tracy, & Galea, 2006). Research with earthquake survivors after the Marmara earthquake in Turkey suggests the rates of major depression in earthquake survivors ranged from 13% to 22% (Salcioğlu, Başoğlu, & Livanou, 2003). The figure for major depression among survivors after the Armenian earthquake was 18% (Armenian et al., 2002).

1.3.2. Suicide ideation and natural disasters

Research following natural disasters found that stress and disruption were risk factors which increased the likelihood of suicide (Krug et al., 1998). The study used data from countries which experienced natural disasters, and found that rates of suicide increased 62.9% in the first year post-earthquake disaster. A recent research study found that suicide rates decreased initially following disasters (Gorden, Bresin, Dombeck, Routledge, & Wonderlich, 2011). This study suggests that the lower prevalence of suicidality might be temporary as people work together during a shared tragedy and support one another, which may increase feelings of belongingness (Gorden et al., 2011). However, as community solidarity erodes in the long-term, and resources are withdrawn, some people may develop a sense of hopelessness over time (Gorden et al., 2011), which could potentially lead to depression symptoms and ultimately increase suicide.

Vehid, Alyanak and Eksi (2006) found after the Marmara earthquake in Turkey, 16.7% of students reported increased suicide ideation. Suicidal ideation was greater among students who suffered more losses, in the aftermath. Factors which increased the risk for

suicidal ideation were sustaining a severe injury; experiencing losses such as a family member, friend, job, or property were all associated with mental health problems including depression (Krug et al., 1998). Imamura (1995) report that property loss, the failure of social security systems, the length of the period of mourning, hopelessness and depression were factors increasing suicidal behaviour in aftermath of natural disasters. With the challenges of adjustment to change and loss, Bonanno et al., (2010) suggest that pre-existing depression may place people at risk for increased suicidal ideation after a disaster. Consequently, Christchurch people already struggling with depression symptoms and suicidal thoughts prior to the earthquakes may be at higher risk for suicidal ideation after the earthquake.

1.3.3.   *Incidence of natural disasters impact on well-being*

Consequences of natural disasters represent a significant public health problem and can depend on pre- and post-disaster factors (Wahlström, Michelsen, Schulum, & Backheden, 2008). Despite some studies showing a persistence of psychological symptoms across time following earthquakes, others have demonstrated marked reductions in symptoms post-disaster (Wahlström et al., 2008). For example, following a Japanese earthquake in 2004, Kuwabara et al., (2008) found 59.3% of participants had psychological symptoms immediately after the earthquake. At 5 months this had decreased to 21.8%. This study suggests that even after the initial impact of the event, 21.8% survivors still suffered psychological symptoms.

In the days, weeks, and months following a disaster, survivors can struggle to regain a sense of who they were before the event, as they try to adapt to various resource losses and to the emotional reminder of their traumatic experiences (Norris, Friedman, Watson, Byrne, & Kaniastry, 2002). Research suggests that the personal losses, and community destruction as a direct consequence of the natural disaster, may lead to decline in social networks and support, for affected communities, which precedes any long-term decline in psychological well-being,

including depression (Kaniasty & Norris, 1993). A study by Shore, Tatum, and Vollmer (1986) found that greater exposure to a natural disaster led to higher levels of depression. It appears living with constant fear and uncertainty in times of unexpected and sudden changes to an individual's lifestyle can have consequence for psychological disturbances (Başoğlu et al., 2004). It is suggested, the uncertainty of how long aftershocks will continue in the Canterbury region may heighten the development of depressive symptoms.

A study completed 6 months after the 1989 Newcastle (Australia) earthquake, looking at community disaster experiences and reactions, found that on ongoing disruption lead to depression (Carr et al., 1995). The prospective research suggests that with the loss of the central business district, homes, businesses and livelihoods, the population of Christchurch may be susceptible to the development of depression, especially as disruption continues.

After Hurricane Hugo struck two cities in Carolina state (U.S), Thompson, Norris and Hanacek (1993) noted persistent threat to life and injury were risk factors for a variety of mental health problems, including depression, anxiety, somatic complaints, general stress, and traumatic stress. In the months after the February 2011 earthquake, and ongoing aftershocks, anticipatory anxiety may be associated with fears of a repeated event or threat of major aftershocks (Goenjian et al., 2000). The prolonged stress of earthquake survivors living daily with the threat of further earthquakes, increases psychological symptoms (Bödvarsdóttir & Elklit, 2004; Frans, Rimmö, Åberg & Fredrikson, 2005), as they struggle to manage a sense of control in living. It is suggested that failure to do so, with the addition of prolonged earthquakes may contribute to some people developing depressive symptoms (Madianos & Evi, 2010).

1.4. Psychosocial factors that increase risk of depression

Studies suggest that symptoms of depression, anxiety and stress occur at relatively high frequencies in the general population and may be relatively common in the 6- to 12-

month period, post disaster, as a result of exposure to disruptions, relocation and loss events (Carr et al., 1995; Miguel-Tobel et al., 2006).

1.4.1. Loss and ongoing adversity

A study following the 2001 World Trade Centre disasters, found 9.7% of the community living closest to site, had depression symptoms, which were predicted by losses as a result of the event (Galea et al., 2002). After a devastating disaster people may have to deal with the loss of their home and lifestyle, and in the case of earthquakes the sudden temporary or permanent relocation which disrupts their neighbourhood and community (Carr et al., 1995). Depression experienced by earthquake survivors was the main finding in a study by Armenian et al., (2002). Risk factors for depression in the general population were loss, geographic location, intensity of disaster, and female gender. It has been found that after an earthquake cumulative loss (such as personal losses and financial losses) is a strong predictor for depression (Bonanno et al., 2010; Kiliç et al., 2006). Moreover Sattler et al., (2006) found that damage to a home and loss of personal and object resources contributed to depression symptoms following the El Salvador earthquake in South America.

1.4.2. Disruptions and depression

Research indicates that disruption is a major factor in the development of depression after a disaster (Person et al., 2006). While comparisons across studies are complicated by the type of disaster, sample, and study design, cross-sectional research suggests that depressive symptomatology may be elevated in the immediate aftermath of a disaster, particularly among those with greater exposure to disruptions and displacement (Carr et al. 1997; Norris et al., 2002; Person et al., 2006).

Research by Liberman et al., (1990) found 85% of people suffered psychological disturbance two weeks after an earthquake. Three months after an earthquake the figure was reported at 40%. As time went on 40-50% still continued to experience ongoing disruptions

and experience psychological difficulties four years later (Lima et al., 1989). Furthermore, Carr et al., (1995) suggests that ongoing psychological distress following earthquakes is associated with the possibility of repeated aftershocks and continued disruptions such as loss of property, displacement and domestic relocation, and infrastructure redevelopment.

Norris (2002) reported personal loss as a result of disaster tended to increase negative affect such as depressive thoughts of hopelessness. It is suggested that very real psychological disturbances could continue for some years after the earthquake disaster.

1.4.3. Relocation and displacement

Coping with displacement and stress can be particularly difficult for those who have had to relocate to places that are vastly different from their physically damaged house and property or the house is inhabitable (Bonanno et al., 2010; Wadsworth, Santiago, & Einhorn, 2009). A study by Najarian, Goenjian, Pelkovitz, Mandel, and Najarian (2001) found rates of depression to be significantly higher among earthquake survivors relocated to a different, relatively unaffected area, compared to survivors who remained in the earthquake zone.

In a study of Armenian earthquake survivors, Najarian et al., (2001) found that relocated women, compared with women who stayed in the city, had higher rates of depression. The damage and loss of property and having to move out of one's community, and relocate continues to be stressful as people try to cope, along with managing ongoing problems due to other losses and disruptions (Carr et al., 1995; Kiliç et al., 2006). It suggested that relocation as a result of loss is highly disruptive, and a major risk factor for depressive reactions following earthquake disaster. For instance, after an Italian earthquake, people who did not relocate (remained in their community), and people who returned to their homes shortly after relocating, managed better in terms of psychological functioning (Bland, O'Leary, & Farinaro, 1997).

A study by Sharan et al., (1996) indicated that the degree of destruction of a person's house and property was significantly associated with the severity of psychiatric morbidity which may suggest the development of severe depression, due to their fundamental losses. Similar research by Kiliç et al., (2006) found that earthquakes cause high rates of psychological distress, and may last for many years when relocation after the disaster has an added effect on earthquake stress disruptions and depression.

Studies have shown that earthquake affected communities show stress reactions in people who have been forced to adapt quickly to new circumstances because of major damage to homes, loss of personal and material resources (homes) and major disruptions (Bödvarsdóttir & Elklit, 2004; Carr et al., 1997).

High levels of disaster stress can overwhelm an individual's emotional regulation and ability to adapt to the stressful circumstances in the wake of an earthquake. A study was conducted 7 months after the magnitude 8.0 earthquake (2008) in Sichuan, south-western China. Thousands of people were killed, many were missing and over 4.8 million were left homeless. The study found predictive factors of loss of friends or neighbours, residential house damage or collapse, and proximity to the epicentre was significantly related with severe mental health problems, among survivors of the two different communities (Chan et al., 2011).

The impact of February 2011 earthquake resulted with many work premises, schools, shopping centres and support services closed for weeks. Replacement of damaged systems and the continuing repair work after the aftershocks to many parts of the Christchurch city water supply, power network and other services have taken longer to replace than following the September 2010 earthquake event. Many people were faced with having to leave their severely damaged or beyond repair homes, along with ongoing stress and uncertainty (not knowing) while waiting on property decisions. Other people have chosen to leave as result of

uncertain times, the continued aftershocks, causing increased damage which exacerbates feelings of hopelessness, and may be a major predictor of depression.

Different areas in Christchurch were differentially affected by the earthquakes, so have experienced different levels of disruption. People in the more physically affected suburbs may have greater thoughts involving loss of control and more ongoing emotional turmoil as consequences of waiting for decisions on the future of their property. These factors may increase people's stress levels, along with subsequent aftershocks causing more physical damage. Some people may have a sense of loss of identity (family homes) as well as loss of neighbours and community, as well as loss of employment, businesses or uncertainty about continued employment and viability of businesses which may be another factor contributing to risk of depression. Research suggests loss of these personal connections may potentially lead to an increase in depression symptoms (Bonanno et al., 2010).

1.4.4. *Depression, anxiety, traumatic stress comorbidity*

Research studies indicate that depression, anxiety, PTSD and acute stress symptoms can overlap after earthquake disasters, and symptoms of one disorder may serve to exacerbate or prolong symptoms of another (Goenjian et al., 2000; Madianos & Evi, 2010). Recent earthquake disaster research by Sattler et al., (2006) suggests depressive symptoms may be integrally linked to acute stress. Moreover, anxiety is a common psychological response post-disaster, which may contribute in the long term to depression (Norris et al., 2002). The major earthquakes and ongoing aftershocks in Christchurch are likely to increase anxiety in many people. Anxiety created by the initial earthquakes may heighten anticipatory anxiety as people continually appraise potential danger to themselves, their family, property and community (Bonanno et al., 2010). Living in an uncontrollably stressful environment as a result of the earthquakes and aftershocks may increase thoughts of helplessness and feelings

of hopelessness (Livanou et al., 2005). An earthquake survivor may experience persistent negative thoughts, be fearful of future earthquakes (Başoğlu et al., 2004) and become disheartened. Depression can potentially result, as people begin to believe there is little hope. Continued aftershocks and disruptions may lead to development of belief that the situation is uncontrollable, and that despite reprieve, other setbacks will occur. Ongoing aftershocks and anxiety may contribute further to feelings of hopelessness (Bödvarsdóttir & Elklit, 2004), which may contribute to the development of common depression symptoms such as sleep disturbances, changes in eating patterns, low energy, loss of motivation, problems concentrating, and suicidal ideation. Anxiety and sleep difficulties may be a function of depression but may also be multi-factorial due to grief, and anxiety related to recurrent triggers (e.g., aftershocks). In addition, in order to cope with losses and manage stress following a disaster, there may be increased alcohol and tobacco use (Bonanno et al., 2010).

A number of studies have reported that exposure to traumatic and stressful events, such as earthquakes can threaten, destabilise, invalidate and even shatter an individual's fundamental beliefs and implicit assumptions about their world (Bödvarsdóttir & Elklit, 2004; Elwood, Hahn, Olatunji, & Williams, 2009). Included, may be beliefs about safety (e.g., I'm in perpetual danger) and self-efficacy (e.g., I'm helpless to do anything). The level to which such events disrupt previously held assumptions is thought to determine the nature and severity of posttraumatic outcomes (Janoff-Bulman, 1992). After the February earthquake, some individuals may have struggled for their own survival. Others may have seen dead people and/or people injured. As a consequence, a person's sense of benevolence about the world may have been challenged because now as a result of the earthquake, their world was experienced as not safe. There are many reasons for this as follows; there were fatalities, huge losses to homes, buildings and communities, as well as widespread

disruptions across the city. It is postulated that the consequences of these events may lead to the development of depression as people experience loss of control in their world.

A study by Ullman and Newcomb (1999) showed that earthquake survivors, who had higher levels of perceived control before the disaster, experienced less intrusive symptoms following the earthquake. Recent research by Dorahy and Kannis-Dymand (2012) found that the uncontrollability of stress responses to aftershocks was the only cognitive predictor for depression and anxiety following the Canterbury earthquake on 4th September 2010. They also found that depression accounted for a large amount of variance (70.4%) in the prediction of acute stress symptoms (Dorahy & Kannis-Dymand, 2012). This is consistent with other studies, which found a high association with mood (depression), and acute stress symptoms following earthquakes (Fullerton, Ursano, & Wang, 2004; Sattler et al., 2006). A person may be feeling anxious and helpless because of their perceived uncontrollability of their response to the aftershocks, along with the fear of future unpredictable events (aftershocks), which in turn maintains psychological distress, and which may contribute to symptoms of depression and anxiety. The 22nd February earthquake involved much greater loss (lives, businesses, houses, infrastructure, and communities) than the September, 2010 earthquake, which may have increased the sense of hopelessness. This suggests that people in the long term, may develop more symptoms of depression as they further experience uncontrollability of stress responses. A person may then have to deal with a stressful unsafe environment, as well as the risk of more disruptive aftershocks, as several earthquakes occur in succession (Bödvarsdóttir & Elklit, 2004).

1.5. Learned helplessness and depression

Seligman's theory of "learned helplessness" (Abramson, Seligman, & Teasdale, 1978) may be helpful in understanding how stressful events may lead to depression. Although the research to support the theory was initially conducted with animals, the effects of learned

helplessness can also be seen in depressed humans (Abramson et al., 1978). This theory proposed that when people experience chronic or repeated stressful events, they learn to feel helpless and experience a sense of being unable to influence their environment or their future. The feeling of helplessness is strengthened when a person believes he or she has no control over the stressful situation.

Seligman (1975) proposed that the learned helplessness concept may serve as a model to provide a theoretical explanation for behaviour that develops as a result of reactive depression. The model suggests individuals become depressed when they experience uncontrollable situations and perceive their responses as generally ineffective in unpleasant consequences (Abramson, Metalsky & Alloy, 1989). Further beliefs that the situation is hopeless may lead to the development of depressive symptoms in a person due to these cognitive appraisals (i.e., consequence of learning that outcomes are uncontrollable; Abramson et al., 1989). The recurring disruptive aftershocks experienced in the Canterbury region potentially reflect stressful events beyond an individual's control. People developing a sense of learned helplessness from these events may progress through successive stages of fear and anxiety to depression (Abramson et al., 1989). Başoğlu et al., (2004) found that fear during earthquakes was associated with anticipatory fear of future earthquakes and feelings of helplessness two years post-disaster.

In general terms some people may experience a sense of helplessness as a result of uncontrollable aftershocks which generate beliefs about future threat and danger. This may be especially salient for those who have been physically and emotionally affected the most. Such ongoing anxiety and helplessness may lead to a greater prevalence of depressive symptoms in those individuals.

1.6. The present study

The present study assessed individuals living in suburbs physically affected in different ways by the earthquakes at two time points. This prospective follow-up study aimed to examine depression across communities differentially affected by the earthquakes, along with the psychosocial factors that predicted depressive symptoms following the earthquakes and ongoing stressors. The study measured the same people 4-6 months (time 1) and 8-10 months (time 2) after the February 2011 earthquake. In summary, the study explored the impact of continuing exposure to distress, anxiety and depression symptoms. Measures of loss and disruptions were assessed as well as anxiety from ongoing aftershocks. Given the impact of major stress, loss, and disruption on depression, following earthquakes (Carr et al., 1995; Sattler et al., 2006), and research which suggests that depressive symptomatology may be elevated in the aftermath of a disaster, particularly among those with greater exposure to distress, losses, disruptions and displacement (Bonanno et al., 2010; Carr et al., 1997; Norris et al., 2002), it was hypothesised that those in the suburbs most affected would have higher levels of depression. Secondly, in line with learned helplessness it was expected that depression at time 2 would be predicted by initial symptoms of acute stress and anxiety (i.e., time 1), material and personal losses, disruptions, along with ongoing aftershock anxiety.

CHAPTER TWO

2. METHODS

2.1. Participants

The participants were 134 home-dwellers living in two differentially earthquake affected suburbs of Christchurch, New Zealand. The two suburbs were Avonside and Hornby, and were chosen because according to the 2006 census data they had same size population, as well as a similar gender and socioeconomic demographics (www.stats.govt.nz/Census/2006CensusHomePage.aspx). For example, both suburbs had communities of around 3,200 people, earned an average yearly household income of approximately $22,000, and had a similar percentage of those earning below $20,000 annually. Therefore they were matched demographically.

The more physically affected suburb of Avonside had been severely affected by the September 2010 earthquake (Dorahy & Kannis-Dymand, 2012), with major property and utility (e.g., water, sewage, electricity) loss and damage, displacement and soil liquefaction occurring on both occasions.

The two community groups did not differ statistically in age and sex. The mean age was 44.3 (SD= 14.1, range 21-78), and 61.9% were female, 38.1% male in the total sample. Those from the affected suburb (n = 67) were 24 male and 43 female adults aged from 21-78 years (*M* = 46.52, *SD* = 13.72). Those from the relatively unaffected suburb were 27 male and 40 female adults aged from 22-75 years (*M* = 42.42, *SD* = 14.25). The sample from the more physically affected suburb of Avonside had slightly older participants, mean 46.5 compared to 42 years of age.

Data collection occurred over two time points using a door-to-door survey method, with participants completing their second assessment approximately 5 months after the first

assessment. The 134 participants described here represent follow-up data collected at time 2 assessment. At time 1 assessment, 100 people from the suburb more physically affected by the February 2011 earthquake were surveyed, and data was collected on alternate days in both suburbs from 7th June 2011 to 23rd August 2011. In this suburb, 606 households were approached, 65 declined involvement, no answer at 208 households, and there were 233 vacant houses as a result of severe physical damage and/or possibly inhabitable houses. To provide a comparison sample with the more affected group. At time 1, 100 people were recruited from a relatively unaffected suburb by the February 2011 earthquake and were surveyed, and data was collected on alternate days in both suburbs from 7th June 2011 to 23rd August 2011. In the less affected suburb, 757 households were approached, 113 declined involvement, there was no answer at 529 households, and 15 houses were vacant. At time 2, 134 of the original 200 participants agreed to a follow-up interview and were contactable. Data collection was again conducted by way of a face-to-face survey and was completed from 28th October 2011 to 10th January 2012. The data collection was assessed at two different times and with continuing seismic activity. The total community sample in this study experienced future aftershocks and two large unexpected earthquakes (on 13th June 2011 and again on 23rd December 2011) occurred.

2.2. Measures

The survey questionnaire was initially developed as part of an earlier study (Dorahy & Kannis-Dymand, 2012). It contained the Acute Stress Disorder Scale (ASDS) (Bryant, Moulds, & Guthrie, 2000), the Patient Health Questionnaire-9 item depression module (PHQ-9) (Spitzer, Kroenke, & Williams, 1999), and the Generalized Anxiety Disorder-7 scale (GAD-7) (Spitzer, Kroenke, Williams, & Löwe, 2006). All items referred back to the February 22nd earthquake and ongoing aftershocks. The ASDS was administered first, followed by the PHQ-9, GAD-7, and finally the single-item measures. After each scale (i.e.,

ASDS, PHQ-9, GAD-7) participants were assessed whether any of the reported difficulties were present following the September earthquake and aftershocks. Responses were 'no', 'yes', 'made worse by EQs', 'yes, no worse since EQs', and 'yes, better since EQs'. The battery also asked general demographic questions (e.g., age, sex). In addition, single item questions assessed increases in medication, alcohol, smoking, and recreational drug use since the February earthquakes. The response format went from 'not applicable' through 'reduced', 'not at all' and right up to 'a significant amount'. Participants were also asked dichotomous response ('yes/no') questions regarding whether they lived without electricity, water, and sewage service for two or more days following the February earthquake, or whether they had to move house as a result of the quake. They also responded on a dichotomous scale to whether they had lost anything (e.g., house, family member, and job) from the quake. Furthermore, single items asked participants how well they believed they could predict and control their responses to aftershocks, and how anxious aftershocks made them. Responses ranged from 1-10 with higher scores indicating more anxiety predictability and controllability with responses to aftershocks. The same response format was used to assess 'how on edge' participants felt as a result of the quakes. On a 0 (N/A) to 5 (extreme) participants rated the degree to which the earthquakes had disrupted their work, household tasks, leisure activities, family unit, and relationship with partner, children, and family/friends. Responses to the seven items were averaged to get a single score for psychological disruption. Finally, in the first phase of the study the above scales and items were anchored to the period since the February earthquake. In the second phase of the study, the time anchor was the last 3 months.

2.2.1. Acute Stress Disorder Scale (ASDS)

The ASDS is a 19-item inventory that is based on Diagnostic and Statistical Manual of Mental Disorders criteria for acute stress disorder (American Psychiatric Association,

1994). The ASDS is widely used in research and clinical settings (Bryant, Moulds, & Guthrie, 2000). Items assess dissociation, re-experiencing, avoidance, and arousal on a Likert-type scale ranging from 1 (not at all) to 5 (very much). For this study the items were attached to either the recent earthquake or the aftershocks, whichever the participant found more distressing. The ASDS has demonstrated excellent psychometric properties, with Cronbach's alphas higher than .8 for total and subscale items (Bryant et al., 2000). Research based on a sample of 107 bushfire survivors (Australia), found a Cronbach's alpha of .96 for total ASDS (Bryant et al., 2000). A more recent research study with Chinese earthquake survivors, found that the four-factor structure for the ASDS was consistent with DSM-IV clusters; dissociation, re-experiencing, avoidance, and arousal (Wang, Li, Shi, Zhang & Shen, 2010). The ASDS was included in the study because large earthquakes were continuing (e.g., 2 struck on June 13th 2011, measuring 6.3 and 5.9). Thus, for many trauma stimuli were still acute.

2.2.2. Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a widely-used nine item self-report measure of the symptoms of major depressive disorder based on the DSM-IV criteria for depression. The PHQ-9 is used as a short diagnostic and depression severity measure in both research and primary health care settings (Spitzer et al., 1999). Participants rate how much they were bothered by each item over the past two weeks using a 4-point Likert scale from 0 (not at all) to 3 (nearly every day). The summed symptom severity scores (can range from 0 to 27) and then can be interpreted as indicative of no depression, mild (>5), moderate (>10), moderately severe (>15), and severe (>20) depression (Kroenke & Spitzer, 2002). A total score of 10 on the PHQ-9 has also been identified as a threshold for identifying DSM-IV depression (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 has been found to have excellent internal consistency, test re-test reliability, and construct validity in a general population (Martin,

Rief, Klaiberg & Brachler, 2006). The PHQ-9 has been demonstrated to be a reliable and a valid measure of depression severity (Kroenke et al., 2001). Research by Cannon et al., (2007) reported that the PHQ-9 was highly correlated with the Structured Clinical Interview for DSM-IV (SCID) diagnoses for a major depressive episode and depressive disorder. Psychometric studies indicate an internal consistency of .86–.89, and the measure is sensitive to change (Kroenke et al., 2001). For this study, it was implemented as a measure to assess depression symptom severity.

2.2.3. *The Generalised Anxiety Disorder Scale (GAD-7)*

The GAD-7 is a brief 7 item self-report measure of anxiety symptoms (Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD-7 measure is a one-dimensional scale designed to assess the presence of the symptoms of generalized anxiety disorder referred to in the DSM-IV. It is also thought to be a good measure of general anxiety symptoms (Spitzer et al., 2006). GAD-7 items address how often over the past two weeks participants have been bothered by anxiety symptoms. Responses range from 0 (Not at all) to 3 (Nearly every day). Therefore, the total sum score ranges from 0 to 21. According to the original authors (Spitzer et al., 2006), the total score may be categorized into four severity groups: minimal/no anxiety (0–4), mild (5–9), moderate (10–14), or severe (15–21), with an optimum cut-off value for clinical anxiety of 10. A study reported that the GAD-7 is a reliable and valid measure of anxiety in a general population (Lowe et al., 2008). The GAD-7 has demonstrated good reliability, along with construct, criterion, factorial, and procedural validity (Spitzer et al., 2006), and was used in this study as a measure of anxiety severity.

2.3. Procedure

Participants completed the survey approximately four months after the February 22nd earthquake (time 1) and completed the survey again at follow-up (time 2) approximately 10

months after the Canterbury earthquakes. A door-to-door survey methodology was carried out, and participants were assessed at their own home. After reading the information sheet (Appendix A) and signing the consent form (Appendix B), participants were administered the four page survey (Appendix C) by the researcher. The survey took approximately 20-40 minutes to complete. Upon completion, participants were given further information about the goals of the study, asked about their experience of participating, and given an information sheet offering free support and counselling services in Christchurch (Appendix D) and self-help educational resources (Appendix E). The study was approved by the University of Canterbury Human Ethics Committee (Appendix F).

2.4. Design and statistical analysis

The major focus of this study was to examine the relationship between depression and psychosocial factors following the earthquakes. Group comparisons were made between the more physically affected area (Avonside) and the less physically affected area (Hornby) based on time 1 data and then with the follow-up data at time 2. Demographic and sample characteristics were calculated for each group. Exploratory Analysis began by calculating descriptive statistics via means, standard deviations, range, and distributions for each independent variable of time and location, at both time one and time two with dependent variable depression scores. Depression was assessed using the Public Health Questionnaire-9 (PHQ-9) (Kroenke, Spitzer and Williams, 2001). Regression was used to assess predictors of depression at time 2 on the overall sample. Unless otherwise specified, inferential statistics were evaluated against an alpha level of .05.

CHAPTER THREE

3. RESULTS

3.1. Demographic characteristics

The demographic data of the two samples are presented in Table 1. A marginally non-significant effect was found for age across location, $F(1,133) = 3.38$, *ns*. A chi-square analysis showed no difference between sex (gender) across location, $\chi^2 (1, N = 134) = .285$, *ns*.

3.1.1. Descriptive data for Measures of depression, acute stress and anxiety

The average scores for participants in the more affected community group sample of Avonside, and the relatively unaffected community group sample of Hornby for PHQ-9 scale, ASD scale and GAD scale measures are reported (see Table 1 for group means and standard deviations).

3.1.2. Distribution of depression scores

The distribution of depression scores at both time 1 and time 2 (see Appendix G to review histograms for PHQ-9 measure) were compared. The histogram plots of PHQ-9 scores at time 1 showed the more affected community were normally distributed, while PHQ-9 scores were positively skewed for the less affected community. The histogram plots of PHQ-9 scores at time 2 showed both communities were positively skewed. The histogram plots showed substantial variance between the two communities with PHQ-9 measure.

3.1.3. Sample characteristics

Frequency of Psychological problems before and after the earthquakes: In the total sample, 57.3% of participants reported no psychological difficulties before the earthquakes started. A further 37.3% reported having psychological difficulties before the earthquakes started which were made worse by the quakes. Finally, 5.4% reported that pre-existing

difficulties were made no worse by the earthquakes. Looking at communities, the more affected area had a higher number of participants reporting psychological difficulties before the earthquakes (see Table 1).

Frequency starting medication: In the total sample, 12% of participants reported at time 1 to starting medication for stress, low mood or anxiety since the February earthquake. At time 2, 10.4% reported starting medication for this reason in last three months. Looking at communities, the more affected area had slightly more participants which reported starting medication in last three months earthquakes (see Table 1).

Frequency of reported alcohol use: In the total sample, 41.8% of participants reported increased alcohol intake from a little to a significant amount since the February earthquake. At time 2, 39.1% of participants reported increased alcohol intake from a little to a significant amount in the last three months. There was a higher increase in the lower range ('a little') in the less affected area, but a slightly higher increase in the higher range ('somewhat' - 'quite a lot') in the more affected area.

Frequency of reported cigarette use: In the total sample, 15% of participants reported increased cigarette use from a little to a significant amount since the February earthquake. At time 2, 12% of participants reported increased cigarette use from a little to a significant amount in the last three months. There was a higher increase in the lower range ('a little') in the less affected area, but a slightly higher increase in the higher range ('somewhat' - 'a significant amount') in the more affected area (see Table 1).

Table 1. Demographic Characteristics, Depression and Psychosocial Factors in Two Samples Exposed to the Canterbury Earthquakes

Personal Characteristic	Avonside Sample (*n* = 67)				Hornby Sample (*n* = 67)			
	N	*%*	*M*	*SD*	*n*	*%*	*M*	*SD*
Gender								
Male	24	35.8			27	40.3		
Female	43	64.2			40	59.7		
Age (years)			46.52	13.73			42.07	14.25
Prior Psychological difficulties								
No	34	54.0			40	60.6		
Yes and made worse	27	42.9			21	31.8		
Yes and no worse since EQ	2	3.2			5	7.6		
Started Medication since February								
No	58	87.9			59	88.1		
Yes	8	12.1			8	11.9		
Medication started in last 3 months								
No	59	88.1			61	91.0		
Yes	8	11.9			6	9.0		
Alcohol intake since February EQ								
N/A	4	6.0			1	1.5		
Not at all	40	59.7			33	49.3		
A little	13	19.4			19	28.4		
Somewhat	4	6.0			12	17.9		
Quite a lot	6	9.0			1	1.5		
A significant amount	0	0			1	1.5		
Alcohol intake in last 3 months								
N/A	6	9.0			5	7.6		
Reduced	3	4.5			5	7.6		
Not at all	35	52.2			27	40.9		
A little	12	17.9			22	33.3		
Somewhat	7	10.4			5	7.6		
Quite a lot	3	4.5			2	3.0		
A significant amount	1	1.5			0	0		
Cigarette intake since February EQ								
N/A	53	79.1			55	83.3		
Not at all	4	6.0			4	6.1		
A little	5	7.5			2	3.0		
Somewhat	2	3.0			4	6.1		
Quite a lot	3	4.5			1	1.5		
Cigarette intake in last 3 months								
N/A	43	64.2			41	61.2		
Reduced	1	1.5			2	3.0		
Not at all	15	22.4			21	31.3		
A little	4	6.0			0	0		
Somewhat	2	3.0			2	3.0		
Quite a lot	2	3.0			1	1.5		
Total PHQ-9 (T1)			9.16	4.23			3.76	2.25
Total PHQ-9 (T2)			8.63	4.63			2.78	2.35
ASDS (T1)			45.69	12.23			37.76	10.43
ASDS (T2			31.94	6.7			27.28	5.74
GAD-7 (T1)			8.30	3.82			6.33	3.31
GAD-7 (T2)			6.34	3.06			3.51	2.15

Note: EQ = Earthquake; N/A = Not Applicable; PHQ-9=Patient Health Questionnaire 9-item depression module (Spitzer, Kroenke, & Williams, 1999); ASDS=Acute Stress Disorder Scale (Bryant, Moulds, & Guthrie, 2000); GAD-7=Generalized Anxiety Disorder-7 scale (Spitzer, Kroenke, Williams, & Löwe, 2006).

3.2. Depression across location and time

The average depression scores for participants in the more affected suburb at both time 1 and time 2 were over a total score of five and therefore in the mild clinical range (Kroenke & Spitzer, 2002). The relatively unaffected community had depression scores in the non-clinical range on both occasions (see Table 1). A 2-way ANOVA was conducted on depression scores at time 1 and 2 for both suburbs. The main effect for time was significant, $F(1,132) = 4.236, p< .05$, suggesting overall reduction in depression symptoms over time (see Appendix H). In addition, the main effect for location was also significant, $F(1, 132) = 133.80, p <.001$, indicating that in the more affected suburb (Avonside) residents had higher depression scores overall. The interaction between time and location was not significant $F(1,132) = .366, ns$. However, this analysis did not take into account the considerable overlap between depression, anxiety and acute stress symptoms (Bryant & Harvey, 2000; Goenjian et al., 2000). The relatively unaffected community had depression scores in the non-clinical range on both occasions. Therefore, to isolate depression and examine differences across time and location, a mixed measures 2-way ANCOVA was conducted on PHQ scores at time 1 and 2 for both suburbs, with acute stress and anxiety symptoms at times 1 and 2 as covariates (see Appendix I). There was a significant main effect for location with the more affected location having higher depression scores, $F(1,128) = 84.66, p < .001$. There was no significant main effect for time, $F(1,128) = .874$, suggesting that depression symptoms did not change from time 1 to time 2 (see Appendix J). The covariates of ASD at time 1, $F(1,128) = 16.38, p < .001$, and time 2, $F(1,128) = 9.30, p < .01$, and anxiety (GAD) at time 2, $F(1,128) = 17.14, p < .001$, significantly interacted with time. Anxiety at time 1 showed a non-significant trend with time in the same direction, $F(1,128) = 3.88, p = .051$. These findings suggested that overall acute stress and anxiety reduced significantly from time 1 to 2 (Appendix K). The interaction between location and time for depression scores was

not significant, $F(1,128) = .65$. Thus, when controlling for acute stress and anxiety symptoms the groups did not differ on depression symptoms across time (i.e., both groups showed no indication of reductions in depression symptoms from time 1 to time 2). This indicates no change in depressive mood.

3.2.1. Covariations for depression at time two

Pearson's correlations were used to assess the relationship between depression at time two and variables assessed at both time 1 and time 2, especially those associated with acute stress, anxiety, aftershocks, losses and disruptions. As can be seen in Table 2, strong to moderate associations were found between depression at time 1, and depression at time 2, acute stress and anxiety at time 1, and acute stress and anxiety at time 2. Aftershock anxiety, physical displacement disruptions following the February 2011 earthquake, loss of utilities and loss of personal and material possessions were also correlated with depression at time 2. Disruptions at both time 1 and time 2 were found to be associated with depression at time 2.

Table 2 Correlations between Depression and Predictor Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. PHQT2	--																	
2. PHQT1	.55***	--																
3. ASDST1	.41***	.71***	--															
4. ASDST2	.67***	.43***	.42***	--														
5. GADT1	.39***	.63***	.72***	.41***	--													
6. GADT2	.77***	.52***	.44***	.68***	.44***	--												
7. ANX-AST1	.18*	.39***	.59***	.21*	.64***	.24**	--											
8. UNP-AST1	-.02	.09	.11	-.00	.22*	-.10	.31***	--										
9. UNC-AST1	-.13	.08	.21*	-.02	.27**	-.09	.43***	.69***	--									
10. ANX AST2	.36***	.22*	.40***	.55***	.30***	.37***	.46***	.14	.20*	--								
11. UNP-AST2	.08	.08	.12	.18*	.23**	.16	.35***	.28**	.38***	.44***	--							
12. UNC-AST2	.07	.13	.12	.18*	.23**	.14	.35***	.31***	.38***	.39***	.74***	--						
13. Reloc-home	.32***	.42***	.35***	.25**	.23**	.33***	.14	.06	-.01	.10	-.06	.01	--					
14. Phys-Disrpt	.63***	.57***	.37***	.39***	.28**	.46***	.04	-.08	-.11	.11	-.15	-.09	.53***	--				
15. Knw Kill/Inj	.16	.14	.14	.09	.12	.06	.05	.01	-.03	.00	-.11	-.13	.17*	.12	--			
16. LossesT1	.26**	.28**	.12	.12	.11	.18*	.08	.04	-.05	.09	.07	.05	.39***	.35***	.02	--		
17. LossesT2	.42***	.31***	.24**	.25*	.18*	.34***	-.03	-.06	-.16	.10	-.07	-.12	.19*	.46***	.05	.16	--	
18. DisrupT1	.52***	.67***	.57***	.42***	.55***	.49***	.24**	-.06	-.03	.23**	-.07	-.01	.44***	.59***	.19*	.33***	.35***	--
19. DisrupT2	.55***	.41***	.34***	.38***	.35***	.46***	.08	-.14	-.15	.24**	-.05	-.12	.25**	.52***	.16	.22**	.45***	.78***

Note: T2=Time two; T1=Time one; PHQT2=Public Health Questionnaire-9 (Depression scale) PHQT1=Public Health Questionnaire-9 (Depression scale); ASDT1=Acute Stress Disorder scale; ASDT2=Acute Stress Disorder scale; GADST2=General Anxiety Disorder scale; GADST2=General Anxiety Disorder scale; ANX-AST1=Anxious and aftershocks; UNP-AST1=Unpredictability of aftershocks; UNC-AST1=Uncontrollability of aftershocks; ANX-AST1=Anxious and aftershocks; UNP- AST2=Unpredictability of aftershocks; UNC-AST2=Uncontrollability of aftershocks; Reloc-home=Relocate from home; Phys-Disrupt=Physical disruptions; Knw kill/Inj=Knew someone killed and/or injured; LossT1=Losses at time one; LossT2=Losses at time two; DisrpT1=Disruptions; DisrptT2=Disruptions
* *p* < .05. ** *p*< .01. *** *p* < .001

3.3. Predictors of depression

Hierarchical multiple regression analysis was carried out on the full sample (N = 134) to determine what predicts depression at time 2. As the sample size constrained the number of predictors, variables were chosen based on theoretical consideration (Bonanno et al., 2010; Carr et al., 1997; Norris et al., 2002) coupled with the results of the correlation analysis. Depression at time 1, acute stress and anxiety symptoms at time 1 and 2, and aftershock anxiety at time 1 and 2 were entered into the first block. The second block contained material/personal losses, moving house, physical disruptions (e.g., loss of utilities) and psychological/functional disruptions (e.g., disruptions in relationships, work, social activities). As shown in Table 3 the predictor blocks in the first model accounted for 66% of variance in depression at time 2, $F(7,121) = 37.019$, $p<.000$. Depression at time 1, acute stress at time 2 and anxiety at time 2 emerged as significant univariate predictors on the first block.

In the second block, losses and disruption variables were added and accounted for a further 6% of variance in depression at time 2. The final model accounted for 72.3% of variance, $F(6,115) = 5.342$, $p<.000$. Depression at time 1, acute stress at time 2 and anxiety at time 2 remained univariate predictors, and physical disruptions as well as functional disruptions at time 2 also accounted for significant variance in depression at time 2. This indicates that participants with higher scores for depression at time 1, acute stress at time 2 and anxiety at time 2, and those experiencing physical disruptions and displacement at time 1, along with ongoing disruptions in daily life functioning were more likely to experience depression at time 2. The findings show an overlap among significant predictors of depression in both models. Table 3 summarises the result of this analysis. Overall the predictor variables accounted for a large portion with depression variance.

Table 3 Summary of Multivariate Regression Analysis for Variables Predicting Depression at Time Two

Variable	B	SE B	β	t	P
Model 1					
Total PHQ T_1	.309	.087	.289	3.569	.001***
Total ASDS T_1	-.021	.036	-.054	-.600	.550
Total ASDS T_2	.178	.059	.248	3.041	.003**
Total GAD T_1	-.038	.108	-.030	-.355	.723
Total GAD T_2	.794	.116	.512	6.853	.000**
How anxious do the aftershocks make you?	-.152	.149	-.077	-1.016	.312
How anxious do these aftershocks make you in last three months?	-.003	.155	-.001	-.018	.985
$R = .826., R^2 = .682,\ R^2$Adjusted $= .663, R^2$ Change $= .682$					
Model 2					
Total PHQ T_1	.179	.090	.167	1.986	-.049*
Total ASDS T_1	-.010	.034	-.026	-.303	.762
Total ASDS T_2	.160	.054	.222	2.973	.004**
Total GAD T_1	-.034	.102	-.027	-.333	.740
Total GAD T_2	.669	.110	.431	6.081	.000***
How anxious do the aftershocks make you?	-.013	.143	-.007	-.093	.926
How anxious do these aftershocks make you in last three months?	.008	.134	.004	.056	.955
As a result of an earthquake or aftershocks:					
Had to move house?	-.808	.632	-.075	-1.279	.204
Had to live for more than two days without water, electricity of sewerage (physical disruptions)	2.686	.662	.289	4.057	.000***
Losses (0 = nothing 1= something)	.468	.508	.049	.921	.359
Loss of anything in last three months T_2	.176	.541	.018	.326	.745
Disruption Total T_1 functioning measure (average 7 items)	-.801	.499	-.141	-1.608	.111
Disruption total T_2 functioning measure (average 7 items)	1.060	.481	.161	2.207	.029*
$R = .867., R^2 = .751,\ R^2$Adjusted $= .723, R^2$ Change $= .069$					

Note: Public Health Questionnaire-9 = PHQ-9; Acute Stress Disorder Scale = ASDS; General Anxiety Disorder = GAD; T_1 = Time one of study; T_2 = Time two of study; B = indicates un-standardized beta coefficients; SE B = standard error of B; β = standardized beta coefficient; R^2 = coefficient of determination
* $p < .05$. ** $p < .01$. *** $p < .001$

CHAPTER FOUR

4. DISCUSSION

The purpose of the present prospective study was to explore factors that predict depression in a community sample of adults approximately 10 months after the February 2011 earthquake in Christchurch, New Zealand. In addition, differences in psychological functioning in individuals from a more physically affected area were compared to those from a less physically affected area. A number of psychological symptoms were assessed at two different times, while ongoing seismic activity (aftershocks) continued throughout data collection, including several large (greater than magnitude 5) unexpected earthquakes (e.g., 13th June 2011; 23rd December 2011).

Firstly, it was hypothesised that, in comparison with the sample of adults in the less affected area, adults more affected would experience more depression symptoms. Secondly, it was hypothesised that depression approximately 10 months after the February quake (at time 2) would be related to initial symptoms of depression (at time 1), acute stress, anxiety, losses, disruptions, and aftershock anxiety.

4.1. Summary of findings

Results supported the hypothesis that participants from the more affected area would exhibit higher levels of depression symptoms than participants from the less affected area. Mean scores on the PHQ-9 were significantly higher in the more affected community sample than the less affected community sample, indicating greater variety and frequency of depressive symptoms in the former. This result is consistent with other findings of elevated depression symptoms in participants exposed to earthquake events (Galea et al., 2007; Salcioğlu et al., 2003). In the more affected area depression scores remained in the clinically significant range at both data collection points (Kroenke & Spitzer, 2002). This suggests that

those more physically affected continued to experience considerable depressive symptoms across time. Moreover, there was no evidence of reductions in overall depression symptoms for both groups when acute stress and anxiety were controlled for. Thus depression remained static over time.

There was partial support for the second hypothesis, with total depression (PHQ-9) at time 2 being predicted by the time 1 variables of depression and physical disruptions, such as loss of utilities and loss of personal and material possessions, and the time 2 variables of acute stress, anxiety, and psychological functioning disruptions (e.g., in close relationships and work). This pattern of results is consistent with several studies examining psychological responses associated with depression (Carr et al., 1997; Sattler et al., 2006). With reference to acute stress and anxiety, there is a high overlap between depression, anxiety and acute stress symptoms co-occurring with disasters (Goenijian et al., 2000; Sattler et al., 2006). Interestingly, acute stress and anxiety at time 1 did not predict depression at time 2. Thus, the presence to acute stress and anxiety are related to more depressive symptoms, but are not predictive of future depression, at least following an earthquake.

4.2. Interpretation and comparison with previous research

The major focus of this study was to examine the relationship between a measure of depression and psychological predictor measures of acute stress, anxiety, loss and disruptions. Research suggests depressive symptomatology is elevated in the aftermath of a disaster, particularly among those with greater exposure to distress, losses, disruptions and displacement (Bonanno et al., 2010; Norris et al., 2002). Studies indicate psychological symptoms do not necessarily diminish in the short term. A study by Fullerton, Ursano, and Wang (2004) found those personally exposed to a disaster were at increased risk of acute stress, PTSD, and depression symptoms. The rates of depression increased a year post

disaster exposure. Research following the 1989 Newcastle earthquake in Australia (5.3 magnitude; 13 people killed) reported that nearly half of survivors had elevated depression 6 months and then again at 2 years post-earthquake exposure (Carr et al., 1997). Furthermore, a study found that survivors of earthquakes reported more depression if they experienced difficulties after the earthquake (Nolen-Hoeksema & Morrow, 1991). In summary these findings suggest that disasters (earthquakes) can lead to longstanding psychological symptoms in some survivors, for a considerable time after the events. An important finding in the current study is that depression only remained unchanged when acute stress and anxiety were controlled, apparently because they overlap considerably with depression and are more amenable to natural change over time than depression. Factors predicting depression at time 2 in the current study will now be discussed.

4.2.1. Depression

The findings in the current study indicate that there was greater depressive mood effect at time 2. Depression at time 1 was a significant predictor of depression at time 2. A recent study by Altindag, Ozen, and Sir (2005) measured psychological symptoms in a community population following an earthquake, and found participants posttraumatic stress symptoms improved significantly when measured at time 1 and then 13 months following the earthquake. They found no significant improvement in depression symptoms (as measured in the Beck Depression Inventory; BDI). A further study indicated post-disaster improvement at 6 months and 30 months for posttraumatic symptoms, but not for depression symptoms (measured by CES-D) (Norris, Perilla, Reid, Kaniasty, & Lavizzo, 1999). This is consistent with findings in the current study where depression symptoms did not reduce from 4 months to 10 months post February 2011 earthquake disaster (measured by PHQ-9). Interestingly, recent research indicates survivors exposed to a mass traumatic event and multiple stressors,

appears to be an independent environmental risk factor for depression in the post disaster context (Person et al., 2006).

A possible explanation for more participants in the affected area scoring in the clinical range for PHQ-9 may be influenced by prior psychological symptoms. Firstly, the current study found nearly half of the participants reported psychological difficulties in the more affected area (42.9%), compared to a smaller number in the less affected area before the earthquakes started (31.8%). This finding indicates that prior psychological difficulties were present before the February earthquakes started and may be a factor influencing post-disaster vulnerabilities among the current study sample. Studies suggest that previously identified risk factors for negative psychological sequelae after a potentially traumatic experience, and include pre-existing or current mental health issues (Norris et al., 2002). Furthermore, there were already constant large disruptive aftershocks occurring after September 2010 which may have influenced stress levels prior to the devastating February 2011 earthquake. The heightened depression symptoms, especially for the more affected participants may have resulted from ongoing stressors that disrupt normal functioning. The stressors along with a sense of loss, worry, lack of control and helplessness, may have amplified depression in those who experienced more disruptions following the quake.

This is consistent with a study after the September 2010 Christchurch earthquake which found higher depression for the more physically affected community (Dorahy & Kannis-Dymand, 2012). One of the factors for depression maintenance may be due to people experiencing more disruption stressors. Subsequently, in the present study, people who were more physically affected have faced having to leave their homes, neighbours and community, over the last 18 months. This community was one of the oldest Christchurch suburbs, so many of these participants have lived in the suburb, with community links and family history for decades. It could be argued that feelings of despair contribute to thoughts of helplessness,

and may be elevated as their land is now not suitable for residential use. The New Zealand Government set up the Canterbury Earthquake Recovery Authority (CERA) as a response to the disaster. CERA re-zoned some residential suburbs in Christchurch in response to the earthquakes (see www.cera.govt.nz). The more affected community in the present study (Avonside) has been classified largely as 'red zoned' and many residents are now in the process of resettlement, and relocation decisions as a consequence following the major earthquake disruption. Research findings suggest severe disruption to people's lives can have a strong impact on their psychological well-being. The connections between people and their physical environments have found that attachment to residential environments (i.e., one's house, neighbourhood) creates feelings of comfort and security (Mazundar & Mazundar, 1993). In the present study, it is possible that some people may have greater attachment to the area where they have lived for a long time, and consequently greater feelings of distress when forced to move as a consequence of the disruption. The forced separation as a result of land re-zoning means in effect broken attachment to property and community resources (i.e. house and neighbours) and may be a factor for people's beliefs about helplessness which in turn maintained depressive mood.

Research by Norris (2005) found that depression was the second most commonly found disorder among people exposed to disasters. Depression and suicide ideation can occur in the aftermath of disasters. Conversely, there is literature which shows natural disasters, including earthquakes and hurricanes, often lead to declines in suicide rates in the months following, which may be due to increased community cohesion and friendliness and increased support at the time (Gorden et al., 2011). The relatively low affirmation of suicidal ideation in the current sample at both time points is consistent with previous work. However, research by Gorden et al., (2011) further suggests that as time goes on and resources are withdrawn, people develop a sense of greater hopelessness, which increases mental and

behavioural actions associated with suicide. Factors contributing to suicide ideation are usually the result of a complex range of interacting risk factors such as a stressful negative life event, anxiety, financial adversity, helplessness and social factors such as isolation and lack of support, especially when supports made available immediately after the earthquakes are later withdrawn (Gorden et al., 2011). Research by Chou et al., (2003) suggests prolonged earthquake exposure and stressors may further increase rates. Krug et al., (1998) stated that among natural disasters, it was earthquakes that increased the rate of suicides the most. At the time of writing up this study, the recent suicide rate had not been released. But the prolonged nature of the aftershocks, the withdrawal of resources and people experiencing increased stressors, i.e., the future of their homes and uncertainty, may be combined to suggest the possibility that suicide rates may be on the increase in the Christchurch region.

4.2.2. Acute stress

The findings show that acute stress at time 2 was a predictor of depression at time 2. Participants more affected by the earthquakes reported more acute stress symptoms than those in the less affected. This finding is consistent with research by Bövarsdóttir and Elklit (2004), who found differences between those affected and unaffected by an earthquake. Research suggests that disaster survivors are more likely to exhibit symptoms of psychological distress and emotional problems immediately and for some time after the event when exposed to a multitude of adverse experiences (Sattler et al., 2006; Wahlström et al., 2008). People in the current study may be experiencing acute stress and exhaustion due to prolonged repeated earthquake exposures and consequent difficulties. Depression is potentially maintained because people have to deal with the reality of life changing outcomes as a result of the earthquakes.

Acute stress symptoms may have contributed to disruptions in core beliefs following the earthquakes and caused distress which shattered assumptive world views around the

world being safe, predictable and stable, and having the coping skills to manage (Janoff-Bulman, 1992). This may be especially salient given the unpredictability of earthquakes. The environment may no longer be perceived as life-sustaining, but rather as dangerous and threatening. Continued re-exposure to disruptions reinforces the belief of helplessness as survival cannot be guaranteed (Janoff-Bulman, 1992). It is highly likely that in such an environment a sense of helplessness may contribute to depression and depression maintenance. It seems important to investigate how acute stress influences psychological consequences such as a predictor of depression as a result of exposure following traumatic events in survivors of earthquake disasters.

4.2.3. *Anxiety*

The findings show that anxiety at time 2 was a predictor of depression at time 2. The findings indicate greater anxiety for participants more affected than participants less affected by the earthquakes. The more affected participants may have had greater trauma symptoms and more exposure to adversity and uncertainty. Studies indicate anxiety symptoms tend to be elevated after the disaster and often do not diminish quickly (Goenjian et al., 2000; Norris et al., 2002). Moreover, elevated symptoms of anxiety and depression have been linked to longer recovery periods, and extensive personal and material losses (Goenjian et al., 2000; Norris et al., 2002). Whilst aftershock anxiety did not predict depression at time 2, previous research suggests anxiety created by the initial earthquakes can prolong anxiety as people continually appraise potential danger to themselves, their family, property and community (Bonanno et al., 2010). Conversely the findings in present study indicate that anxiety at time 2 was a significant predictor of depression at time 2. This is consistent with research which has commonly found generalised anxiety to be higher in people exposed to disasters (Norris et al., 2002). The current study suggests ongoing anxiety and prolonged exposure to disturbances may have led to thoughts of hopelessness and beliefs in helplessness.

4.2.4. Losses

In contrast to previous findings (e.g., Kiliç et al., 2006), experiencing losses as a result of the earthquake was not a predictor of depression. Conversely, research by Armenian et al., (2002) found loss was a risk factor for depression, and cumulative losses were a predictor of depression post-earthquake disaster. The current study found loss did not make a specific contribution to depression at time 2. However since data collection there have been further significant losses which were not measured indicating that in time, "loss" may be associated with depression.

4.2.5. Disruptions

The ongoing physical disruptions and psychological functioning disruptions were moderately associated with depression at time 2. This is consistent with the conclusions drawn by Carr et al. (1997) that individuals who report higher levels of depression tend to also report higher levels of disruption distress when survivors are re-exposed to further disruption stressors post disaster. Kendler, Karkowski, & Prescott (1999) suggests after disaster events, elevated depression prevalence may be the result of post-disaster stressors, and is consistent with literature affirming the role of stressful life events in depression onset. Recent research by Kuwabara et al., (2008) found risk factors such as severe house damage and living in temporary accommodation impacted on psychological symptoms and impaired recovery at 5 months post-earthquake disaster.

At the follow up (time 2) of the present study, some participants had to relocate as their houses were uninhabitable, while others continued to live in their severely damaged houses with damaged utilities (sewerage and drainage). Interestingly, Tracy et al., (2011) found that prolonged stressors associated with being displaced from a person's home and disruption in daily stable lifestyle, were consistent with depression risk. The present study found that immediate physical disruptions predicted depression at time 2.

The present study found that psychological functioning disruptions (work, household tasks, leisure activities, family unit, and relationship with partner, children, and family/friends) were a significant predictor of depression at time 2. A recent study found predictive factors of loss of friends or neighbours, residential house damage or collapse, and proximity to the epicentre, seven months after an earthquake, were significantly related to severe mental health problems, among survivors of the two different communities (Chan et al., 2011). Research has found people who had to relocate post-earthquake had higher rates of depression (Kiliç et al., 2006; Najarian et al., 2001).

When social networks are disrupted (neighbours, community) as people are forced to relocate, and when affected survivors lose their support systems, depressive symptoms may develop. The importance of social embeddedness was found to be a strong protective factor against psychological distress (Kaniasty & Norris, 1993). People more affected by the earthquakes may be devastated to have lost their houses (due to severe land damage), and may suffer grief and heartbreak as they have no choice but to move to other unfamiliar places (Kaniasty & Norris, 2008). Consequently their social embeddedness and community networks have been disrupted, which potentially contributes to development of depression.

4.2.6. *Alcohol intake and cigarette use*

In the total sample, nearly half the sample reported increased alcohol use in the first few months after the earthquake (41.8%), which basically had not reduced by time 2 (39.1%). Fewer participants reported increased cigarette use in the first few months after the earthquake (15%), and reduced a little in the last three months (12%). There was higher increase with both drinking alcohol and smoking cigarettes in the more affected community sample. The increase in alcohol and tobacco use is a common characteristic of depression following disaster as people try to cope with stressors (Bonanno et al., 2010). Thus, increased alcohol and cigarette use in this sample is consistent with previous post-disaster

findings. Research by McFarlane (1998) suggests that using substances may be considered as a method of self-medication, and as a way to cope with the impact of the event. For the present study some people may have used alcohol for coping post disaster, which can interfere with psychological functioning.

4.2.7. Medication

In the total sample, a small number of participants reported starting medication for stress, low mood or anxiety since the February earthquake (12%) and at time 2 fewer reported starting medication in last three months (10.4%). This suggests that a relatively small number of people have had psychological difficulties post-earthquake that they sought pharmacotherapy.

4.3. Theoretical considerations

The continuous disruptions to psychosocial functioning, along with immediate depressive symptoms following the quake and persistent acute stress and anxiety symptoms contributed towards earthquake survivors experiencing depression approximately 10 months after the quake. Recent research on the psychological consequences of earthquakes proposes that symptoms of depression, anxiety and acute stress are common reactions in those exposed to such unexpected, life-shattering events (Madianos & Evi, 2010; Norris et al., 1999). The present study explored the relation between depressive mood symptoms and learned helplessness.

Seligman's (1975) theory of learned helplessness generally postulates that continued exposure to uncontrollable events with no experience of a suitable outcome may lead to a reduction in the motivation to control outcomes. This process interferes with efforts to learn that responding can lead to successful outcomes, and initially produces fear (anxiety), which is replaced by depression as the person experiences repeated unsatisfactory outcomes

(Abramson, Seligman, & Teasdale, 1978). The depressive symptoms emerge in individuals who may come to believe they cannot effect a satisfactory solution to the situation, and begin to believe they are powerless which activates feelings of depression, and general beliefs of helplessness. Some of the people in the current study suffering depression may be experiencing several unsatisfactory and unresolved outcomes. These people may now be facing massive challenges, and disruptions in many areas of their lives, including severe damage to their homes, complete loss of house, relocation issues, relationship issues, loss of the Central Business District, loss of employment and businesses, reduced community resources and neighbourhoods, and ongoing financial issues.

The process described by Seligman's model and the findings from the present study suggest that ongoing earthquake-related acute stress symptoms and persistent psychosocial disruptions (all stressors), along with anxiety symptoms (fear), may lead to depression. In the current study data collection was conducted during the thousands of aftershocks which followed the February 2011 earthquake, along with the two further larger earthquakes which occurred in Christchurch (June and December, 2011). Many participants made comments which suggested they began to believe they could not manage the events, or effectively manage their situations. These subjective qualitative comments made by participants during the survey, whilst not quantitatively measured suggested the participants were describing symptoms of helplessness and depression, as they describe feelings of grief and despair. In essence it could be argued that they were beginning to believe themselves helpless in managing their outcomes.

In accordance with Seligman's theory, the feeling of helplessness may have been strengthened as people believed they could not control their environment, as they had no control over the stressful disruptions. This was especially salient for those who have been physically and emotionally affected the most. Such ongoing anxiety and helplessness may

have contributed to the greater prevalence of depressive symptoms for individuals more affected by the Canterbury earthquakes.

4.4. Future research considerations

Research by Rubonis & Bickman (1991) suggests that disasters result in profound disturbance and stress which may lead to continuing emotional difficulties, and then in the research, referred to other studies which suggest psychological effects are acute and dissipate rapidly after danger has past. A major finding of the current study is the fact that depression did not reduce between the two time assessments when the impact acute stress and anxiety were controlled. The present study findings indicate the potential importance of differentiated long term effects in disaster survivors.

In considering the present study findings that depression, acute stress and anxiety symptoms were more common among people who had experienced greater uncontrollable earthquake stressors, it is suggested that the distress responses during or immediately following the stressful event may lead some survivors toward continued difficulty in functioning. The present study found acute stress and anxiety symptoms were partial predictors for depression. It is possible depressive mood may have contributed to additional distress, uncertainty and despair, which may be consistent with people's responses to the continuing earthquakes. The individual may have found ways to manage depression, and then suddenly and unpredictably, he/she was further exposed to more distressing earthquakes. Many people in the more physically affected area were constantly forced to deal with more secondary stress disruptions. Some commented during the survey assessment that they had yet again to deal with shovelling silt from liquefaction coming up through the floor in their homes, further limited access to their property by car, and road closures. They talked about more loss of sleep, despair and were feeling irritable, restless, and overwhelmed. Possibly

their resilience was at an all-time low, consequently the depressed mood was maintained, along with stressful disruptions.

The present study indicates that psychological distress in the form of depression, anxiety and acute stress, was maintained due to the persistent stress associated with the ongoing earthquake disruptions. Over time the depression symptoms did not abate. There is research suggesting a high association regularly found between symptoms of depression, acute stress and anxiety (Bryant, Moulds, & Guthrie, 2000). It is likely to be a factor with survivors of traumatic events, such as earthquakes, that these associations will be found.

Most recent research (Hansen, Armour, & Elklit, 2012) suggested a way to separate such associations. The research examined a replication of a five-factor Dysphoric Arousal model of PTSD with rape survivors and bank robbery survivors. They separated the arousal factor into dysphoric (depressed mood) arousal and anxious arousal factors for assessment. Although the research involved rape survivors and bank robbery, survivors from traumatic events, such as earthquakes have in common the experiences of sudden, unpredicted, and uncontrollable events where individuals are deprived of control and personal power. Hansen et al. (2012) suggested that the dimensionality of Acute Stress Disorder (ASD) be represented as a five factor structure following traumatic exposure and stress reactions, and add insight with ASD diagnoses. For instance, the current study found that acute stress and anxiety were predictors of depression following repeated earthquake exposures. The value of Hansen et al. (2012) research suggests that the model be studied across variant forms of traumatic experiences, hence it application to the current study, because the population sample used here following an ongoing natural disaster may be useful for further understanding of ASD symptoms. It may be helpful to link the five-factor Dsyphoric Arousal model of PTSD to earthquake disasters. Although this is purely speculative, such research may shed light on the psychological symptoms involved in the relationship between depressive mood and anxious

arousal and acute stress, following an unexpected massively disruptive event such as a major earthquake.

4.5. Methodological considerations and limitations

A number of methodological limitations can be identified in the present study. The external validity of the samples and psychometric limitations must be considered in interpreting results. Whilst participants in the relatively unaffected area provided a good matched comparison group for those in the affected area, no effort was made to determine representativeness within each community and many people living in the affected area were forced to move house before data collection due to physical damage to their properties. These individuals may reflect those most highly distressed by the quakes. Along with this limitation, some variables were assessed using single item questions that attempted to capture a multidimensional construct, such as losses. It may have been useful to frame questions to better differentiate aspects of these multidimensional constructs. For example, being able to differentiate between losses following the earthquake may have clarified types of losses associated with depression, which may have offered a more sensitive assessment of predictors of depression.

A further limitation with the present study was participants' recall as to whether prior psychological difficulties were present before the quake occurred after it had happened. Research has found that recall of past psychological states is often distorted, and that peoples' memories for past psychological symptoms, may depend on how they are functioning at the time of assessment (Bonanno et al., 2010). Lastly, the assessment window occurred during ongoing large aftershocks (June and December 2011). Therefore it is suggested that it was difficult to accurately capture which was the signal event for the ASD symptoms. Future research may address these limitations, as well as their impact. Furthermore longitudinal risk

factors for depression may be explored to determine if factors such as psychosocial functioning are an antecedent or consequence of depression following earthquakes.

4.6. Implications of the present study

Given the limited research in the area of earthquake disasters and depression in New Zealand, the findings of this study, despite its limitations, provide useful information for psychological recovery and support programmes after the earthquake disaster, and for future research. The observed strong association between factors associated with depression have been identified in the current study. These include overlap between factors related to depression, acute stress, anxiety and both physical and psychological functioning disruptions. Prolonged periods of helplessness and ongoing post-disaster disruptions continue to be potential influencing factors, along with distress and anxiety. Increase in alcohol consumption as a result of the February earthquake is an important finding from a public health point of view; especially as increased alcohol consumption is associated with depression (Bonanno et al., 2010). All of these variables have important implications for theories of stress and depression because research demonstrates earthquake survivors who are depressed tend to have psychological symptoms in the aftermath of an earthquake (Bonanno et al., 2010; Goenjian et al., 2000; Sattler et al., 2006). The current study demonstrated that unlike acute stress and anxiety symptoms, which reduced over time, depression symptoms persisted. This highlights the importance of intervention that target depression in the months following an earthquake.

4.7. Conclusion

Results from the present study suggest that the experience of a stressful earthquake, aftershocks and adverse disruptions truly and substantially increase the risk of experiencing depression nearly a year after the event. Additional research is needed to explore post

disaster impact on psychological functioning to better understand depression and the influence with acute stress, anxiety and disruptions in predicting depression after an earthquake. Supportive interventions directed towards depression, and other psychological symptoms, may prove helpful in psychological adjustment following ongoing disruptive stressors and uncontrollable seismic activity.

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APPENDIX A   PARTICIPANT INFORMATION SHEET

Participant Information Sheet

College of Science

Department of Psychology
Tel: +64 3 364 2902, Fax: +64 3 364 2181
Email: office@psychology.ac.nz   www.psyc.canterbury.ac.nz

UC
UNIVERSITY OF
CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND
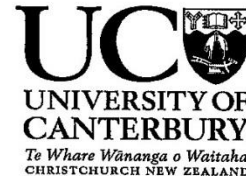
Participant Information sheet

Title: Responses to the February 22nd Canterbury earthquake: A follow-up study

Approximately 3-4 months ago you completed a survey about how you were feeling following the February 22nd earthquake. At that point you agree to be contacted to complete the survey again to see how things are going for you now. Please read the information below which outlines what is involved in this follow-up research. If you would like to take part, which will again take **approximately 15 minutes**, please sign the consent form below. With your consent we may contact you in the future to run through the survey again to see how things have changed.

What is the purpose of the Study?
We are trying to understand how people are managing since the February 22nd earthquake, especially those that have been physically affected by it. Data from this study will help understand people's responses to the earthquake and in what way things change over time.

Do I have to take part?
No. Even though you agreed to us contacting you several months ago, you do not have to take part in this study. It is up to you to decide whether or not to take part. If you decide to continue, I will ask you some questions about how you have felt since the earthquake and to what degree you were affected by it in terms of your psychological well-being. You are free to withdraw at any point. It will take approximately 15 minutes to complete.

What will happen to me if I take part?
Should you decide to take part I will ask you a brief set of questions about how things have been going for you as a result of the quakes.

What do I have to do?
You just simply have to respond to the questions I ask you and if there is any you'd rather not answer, that's fine, we'll skip those ones.

What are the possible disadvantages of taking part?
While you will not be asked to describe any events you may have found distressing, you will be asked whether or not you have had certain experiences and feelings. Some people may find this distressing. A list of support and counselling services is attached in case you find that helpful.

Will my taking part in the study be kept completely confidential?
Yes. You will not be required to put your name or any identifying details on any materials. All the results will be merged together and a paper may be published, but confidentiality of participants will be preserved.

Contact Details:
If you have any further questions please contact Martin Dorahy, PhD (Senior lecturer; University of Canterbury) on (03) 3643416 or martin.dorahy@canterbury.ac.nz or Eileen Britt, PhD (Senior Lecturer; University of Canterbury on (03) 364 2987 or eileen.britt@canterbury.ac.nz

If you would like a summary copy of the results once the study is completed, please contact Martin Dorahy.

Name of researchers
Martin Dorahy (Senior lecturer, University of Canterbury) Department of Psychology, University of Canterbury, Private Bag 4800, Christchurch. Phone 3643416; martin.dorahy@canterbury.ac.nz.

Eileen Britt, PhD (Senior Lecturer; University of Canterbury on (03) 364 2987 or eileen.britt@canterbury.ac.nz

Version 1, 18.9.11
University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand **www.canterbury.ac.nz**

Depression and Earthquakes

APPENDIX B   CONTENT FORM

Consent Form

College of Science

Department of Psychology
Tel: +64 3 364 2902, Fax: +64 3 364 2181
Email: office@psychology.ac.nz   www.psyc.canterbury.ac.nz

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

Consent Form

Title of Project:
Responses to the February 22nd Canterbury earthquake: A follow-up study

Name of researchers:

Martin Dorahy (Clinical Psychologist/Senior lecturer, University of Canterbury); Eileen Britt
(Clinical Psychologist/Senior lecturer, University of Canterbury)

Please initial box

1. I confirm that I have read and understand the information sheet
dated .... for the above study. I have had the opportunity to
consider the information, ask questions and have had these answered
satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to
withdraw at any time, without giving any reason, and my withdrawal will
have no negative consequences on me. ☐

3. I understand that my participation is confidential, i.e., that any information
provided by me is confidential and I will not give any identifying information

4. I agree to take part in the following study ☐

5. I consent that my data be merged with all the other data
☐

_____   _____   _____
Name of Participant   Signature   Date

_____   _____   _____
Researcher/clinician   Signature   Date

6. I consent to be contacted again in the future to do the survey again

_____   _____   _____
Name of Participant   Signature   Date

Contact details:_____

This project has been reviewed and approved by the University of Canterbury Human Ethics.

Version 1, 18.9.11
University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand www.canterbury.ac.nz

APPENDIX C   SURVEY (FEBRURY 2011 EARTHQUAKE)

Survey assessment measures for February 22nd Earthquake Questionnaire

ASDS

Please answer each of these questions about how you have felt **in the past week** as a result of the earthquakes.

		Not at all	Mildly	Medium	Quite a bit	Very much
1	Have you ever felt numb or distant from your emotions?	1	2	3	4	5
2	Have you ever felt in a daze?	1	2	3	4	5
3	Have things around you ever felt unreal or dreamlike?	1	2	3	4	5
4	Have you ever felt distant from your normal self or like you were watching it happen from outside?	1	2	3	4	5
5	Have you been unable to recall important aspects of the earthquakes?	1	2	3	4	5
6	Have memories of the earthquakes kept entering your mind?	1	2	3	4	5
7	Have you had bad dreams or nightmares about them?	1	2	3	4	5
8	Have you felt as if earthquakes were about to happen again?	1	2	3	4	5
9	Have you felt very upset when you are reminded of earthquakes?	1	2	3	4	5
10	Have you tried not to think about the earthquakes?	1	2	3	4	5
11	Have you tried not to talk about the eathquakes?	1	2	3	4	5
12	Have you tried to avoid situations or people that remind you of the earthquakes?	1	2	3	4	5
13	Have you tried not to feel upset or distressed about the earthquakes?	1	2	3	4	5
14	Have you had trouble sleeping?	1	2	3	4	5
15	Have you felt irritable?	1	2	3	4	5
16	Have you had difficulty concentrating?	1	2	3	4	5
17	Have you been overly alert to danger?	1	2	3	4	5
18	Have you been jumpy?	1	2	3	4	5
19	When you are reminded of the earthquakes, do you sweat or tremble or does your heart beat faster?	1	2	3	4	5

* Have you experienced distressing events in the past that lead to you experiencing any of these difficulties before the earthquakes started?

No   Yes & made worst by EQs   Yes & no worse since EQs   Yes & better since EQs

* Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., Sept, Feb, June)?

Not at all   a little   somewhat   quite a lot   completely

PHQ-9

In the *past week*, as a result of the earthquakes, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half days	Nearly the every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

* Were these difficulties present before the earthquakes started (i.e., < Sept 2010)?

No   Yes & made worst by EQs   Yes & no worse since EQs   Yes & better since EQs

* Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., September, February, June)?

Not at all   a little   somewhat   quite a lot   completely

GAD-7

In the *past week*, as a result of the earthquakes, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

* Were these difficulties present before the earthquakes started (i.e., < Sept 2010)?

No   Yes & made worst by EQs   Yes & no worse since EQs   Yes & better since EQs

* Do you feel that any difficulties you reported above are the result of the continuing aftershocks rather than the large specific earthquakes (e.g., September, February, June)?

Not at all   a little   somewhat   quite a lot   completely

* If you checked any problems above (all 3 questionnaires), how difficult have these made it for you to do your work, take care of things at home, or get along with others?

| Not difficult at all | Somewhat difficult | Very difficult | Extremely difficult |

* Before the EQs were you the type of person who was able to adapt to change? (±)				
0 (not at all true)	1	2	3	4 (always true)
* Before the EQs were you the type of person who tended to bounce back from illness and hardship?				
0 (not at all true)	1	2	3	4 (always true)
* Have these albilities (adapt to change/bounce back) changed since the EQs started?				
No	Yes & made worst by EQs	Yes & no worse since EQs		Yes & better since EQs
*As a result of the EQs (*):				
Have you developed a greater appreciation for the value of your own life? (^)				
No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree
Have you developed a greater sense of closeness with others? ($)				
No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree
Have you discovered that you're stronger than you thought you were? (#)				
No	Very small degree	Small degree	Moderate degree	Great degree	Very great degree
*To what extent is each item below is characteristic of you?(@)				
Unforeseen events upset me greatly				
1 (not at all)	2	3 (somewhat)	4	5 (Entirely)
I always want to know what the future has in store in for me				
1 (not at all)	2	3 (somewhat)	4	5 (Entirely)
When I am uncertain, I can't function very well				
1 (not at all)	2	3 (somewhat)	4	5 (Entirely)

*Which EQ affected you the most: Sept   Boxing day   February   June   Aftershocks   Other____

* To what degree has your alcohol intake changed in the last 3 months?   NA

Reduced   Not at all   ↑a little   ↑Somewhat   ↑Quite a lot   ↑a significant amount

* To what degree has your cigarette use increased in the last 3 months?   NA

Reduced   Not at all   ↑a little   ↑Somewhat   ↑Quite a lot   ↑a significant amount

* To what degree has your recreational drug use increased in the last 3 months?   NA

Reduced   Not at all   ↑a little   ↑Somewhat   ↑Quite a lot   ↑a significant amount

* Have you started medication for stress, low mood or anxiety in the last 3 months?   No Yes

* Have you lost anything in the last 3 months as a result of the EQs? (home, job, business, family member)

Age_____   Gender_____

*In the past 3 months, as a result of the EQs, have you sought help from health services? (circle): 1. GP, 2. ACC, 3. Government Helpline, 4. Healthline, 5. counselling, 6. psychologist, 7. Other_____

   If 'no', Why not? 1. Not needed, 2. (please state)_____

* In the past 3 months, as a result of the EQs, have you sought assistance from social services? (circle) 1. WINZ (e.g., sickness, unemployment benefit, emergency grant), 2. Government Helpline, 3. EQC, 4. ChCh City Council customer service (e.g., road, waste, sewage), 4. Other_____

   If 'no', Why not? 1. Not needed, 2. (please state)_____

* In the past 3 months, as a result of the EQs, how on edge have you felt?

Not at all   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Constantly

*How anxious have aftershocks made you in the last 3 months?

Not at all   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

*How on edge do you feel as a result of the aftershocks?

Not at all   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

*How well can you predict the response you will have to each aftershock?

Completely   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

*How much do you believe you can control your response to aftershocks?

Completely   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Not at all

* In the past 3 months, as a result of the EQs, has there been more tension within your family (e.g., peoples relationships have become more frayed)

Not at all   0-----1-----2-----3-----4-----5-----6-----7-----8-----9-----10 Extremely

* Thinking about yourself since the EQs started and how you normally feel, to what extent do you generally feel:

Upset	Hostile	Alert	Ashamed	Inspired	Nervous	Determined	Attentive	Afraid	Active
(Never) 1		2		3		4		5 (always)	

* In the past 3 months, as a result of the EQs, how much disruption have you experienced in:

	NA	Not at all	Some	Moderate	A lot	Extreme
Work outside the home	0	1	2	3	4	5
Household tasks	0	1	2	3	4	5
Social and leisure activities	0	1	2	3	4	5
Family Unit	0	1	2	3	4	5
Relationship with partner	0	1	2	3	4	5
Relationship with children	0	1	2	3	4	5
Relationship with extended family/friends	0	1	2	3	4	5

* In the past 3 months, as a result of the EQs, have you been concerned about the emotional well-being of someone in your house?

No   Yes (specify)_____

* Have you got people around that you can talk to about your experiences (including concerns) since the earthquake?

0 (Not at all)   1 (occasionally)   2 (sometimes)   3 (often)   4 (Constantly)

APPENDIX D   INFORMATION SHEET (SUPPORT SERVICES)

Support Services in Christchurch Information

Support services

Samaritans: 0800 726 666

Lifeline: 0800 353 353; (03) 366 6743

Earthquake counselling helpline: 0800 777 846

Counselling services

Below is a list of counseling services. The Christchurch City Council has also suggested that people make contact with their GPs, who can refer them to free counselling services.

Relationship Services (has offices around Christchurch): 03 366 8804 or 0800 735 283. OFFERING FREE EARTHQUAKE COUNSELLING

Petersgate Counselling Service, Yaldhurst Rd, Upper Riccarton: (03) 343 3391. OFFERING FREE EARTHQUAKE COUNSELLING

Emergency services

Psychiatric Emergency Services: (03) 364 0482

APPENDIX E   INFORMATION SHEET (SELF HELP RESOURCES)

Self Help and Educational Resources for Participants

Christchurch Earthquake
Taking care of yourself

Routines *'Familiarity is comforting'*
Keep up normal activities
Treasure familiar things

Stay connected *'We need each other'*
Stay in touch with family and friends
Take moments to give others your full attention
Listen and answer children's questions simply
Be brave for each other
Ask for and accept help

Save your energy *'Keep it for important things'*
Lower expectations of yourself and others
Take breaks and lighten your workload
Be tolerant of yourself and others
Lots of things can wait
Children may act younger – that's ok for a while

Lifestyle *'Balance is healthy'*
Stay active e.g. go for a walk
Relax – take a break
Limit alcohol
Try to get enough sleep
Try to eat well
Do something nice for yourself

Safety *'Protect yourself in every way'*
Limit exposure to earthquake news e.g. TV
You are not helpless – remember the things you do well
Take care of your spiritual and emotional health
It is ok to be emotional

For extra support contact your GP, or phone 0800 777 846, or go to
www.canterburyearthquake.org.nz

New Zealand College of Clinical Psychologists (NZCCP)

Small Steps Forward To Get Back Into Everyday Life After The Earthquake

It is normal to feel scared and nervous about everyday things after an earthquake, but gradually returning to old places and activities is important.

Here are 10 small steps that can help:

- Pick one place or activity you want to get back to
- Break down the job of getting back into small steps
- Take one step at a time and be patient with yourself
- Breathe slowly on each step
- Stay on the same step until it is easier
- Go back a step if its too hard
- It is important to take a step often
- Ask others for support to take steps
- Notice how far you have come
- Give yourself a pat on the back!

Here are small steps that could be taken over a number of days to go back into a building

---

Go to the building car park
Walk to the building door
Go into the building entrance
Stay on the same level and go further into the building
Gradually go to parts of the building you find more challenging

New Zealand College of Clinical Psychologists (NZCCP)

APPENDIX F   ETHICAL APPROVAL: HUMAN ETHICS COMMITTEE

Ethics Letter for Research Project

HUMAN ETHICS COMMITTEE

Secretary, Lynda Griffioen
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2010/153

16 May 2011
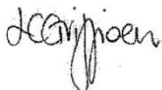
Martin Dorahy
Department of Psychology
UNIVERSITY OF CANTERBURY

Dear Martin

Thank you for your request for an amendment to your research proposal "Psychological responses to September 4th earthquake".

I am pleased to advise that this request has been considered and approved by the Human Ethics Committee.

Yours sincerely

pp

Michael Grimshaw
Chair
University of Canterbury Human Ethics Committee

University of Canterbury Private Bag 4800, Christchurch 8140, New Zealand. www.canterbury.ac.nz

APPENDIX G   DISTRIBUTION OF SCORES ON PHQ-9 MEASURE
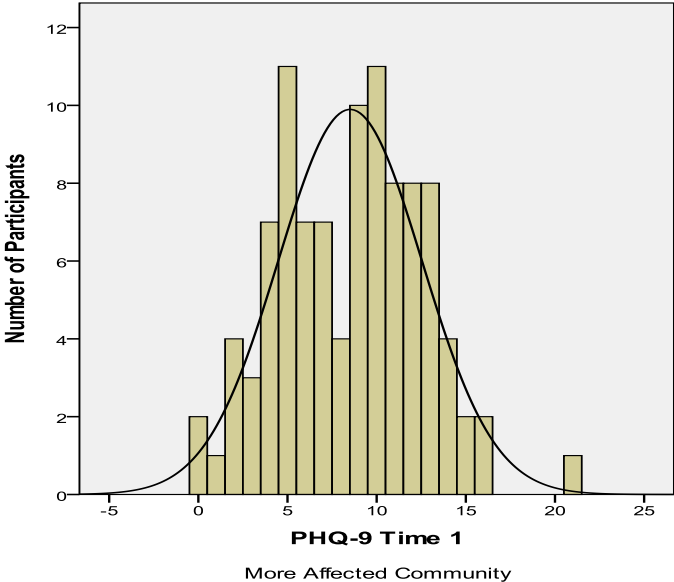
Figure G1. Distribution of scores on the PHQ-9 measure at time 1
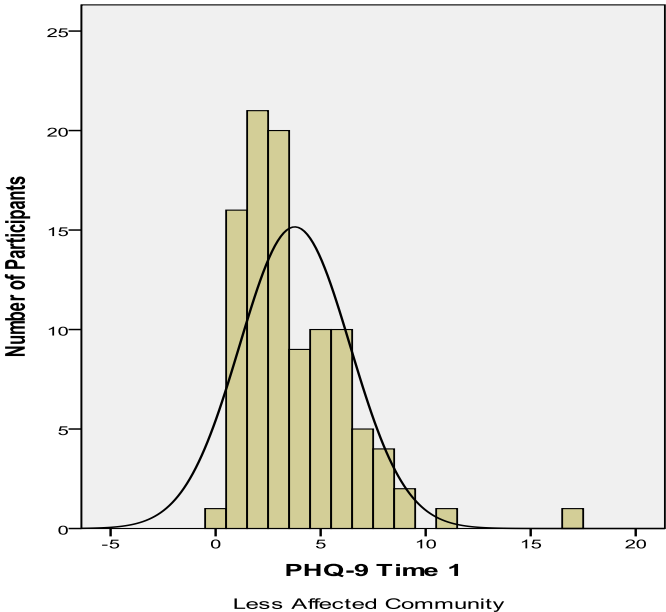
Figure G2. Distribution of scores on the PHQ-9 measure at time 1
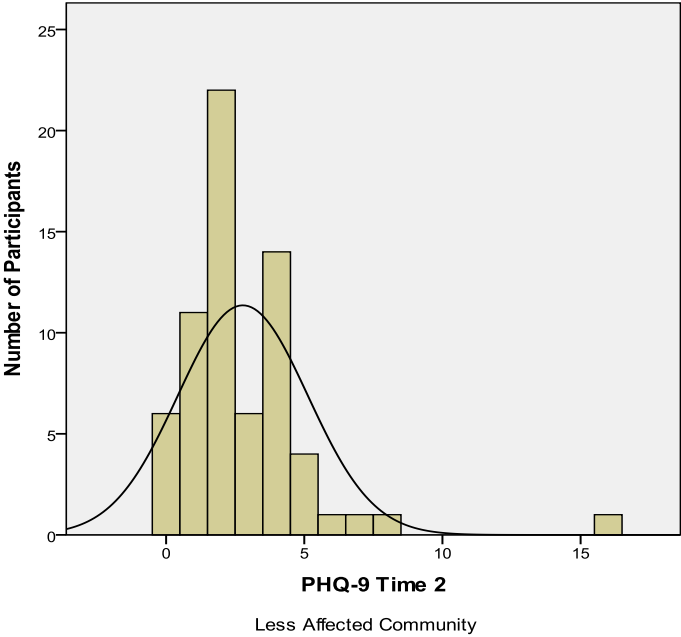
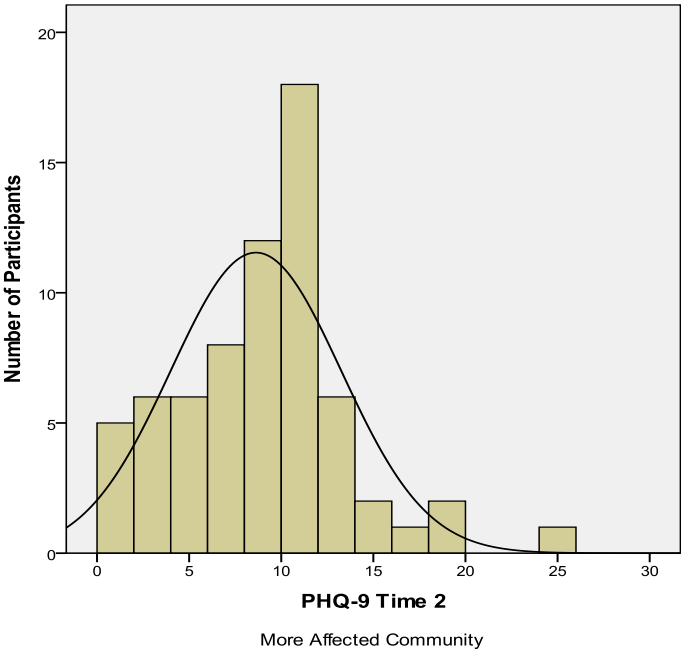*Figure G3*. Distribution of scores on the PHQ-9 measure at time 2

Figure G4. Distribution of scores on the PHQ-9 measure at time 2

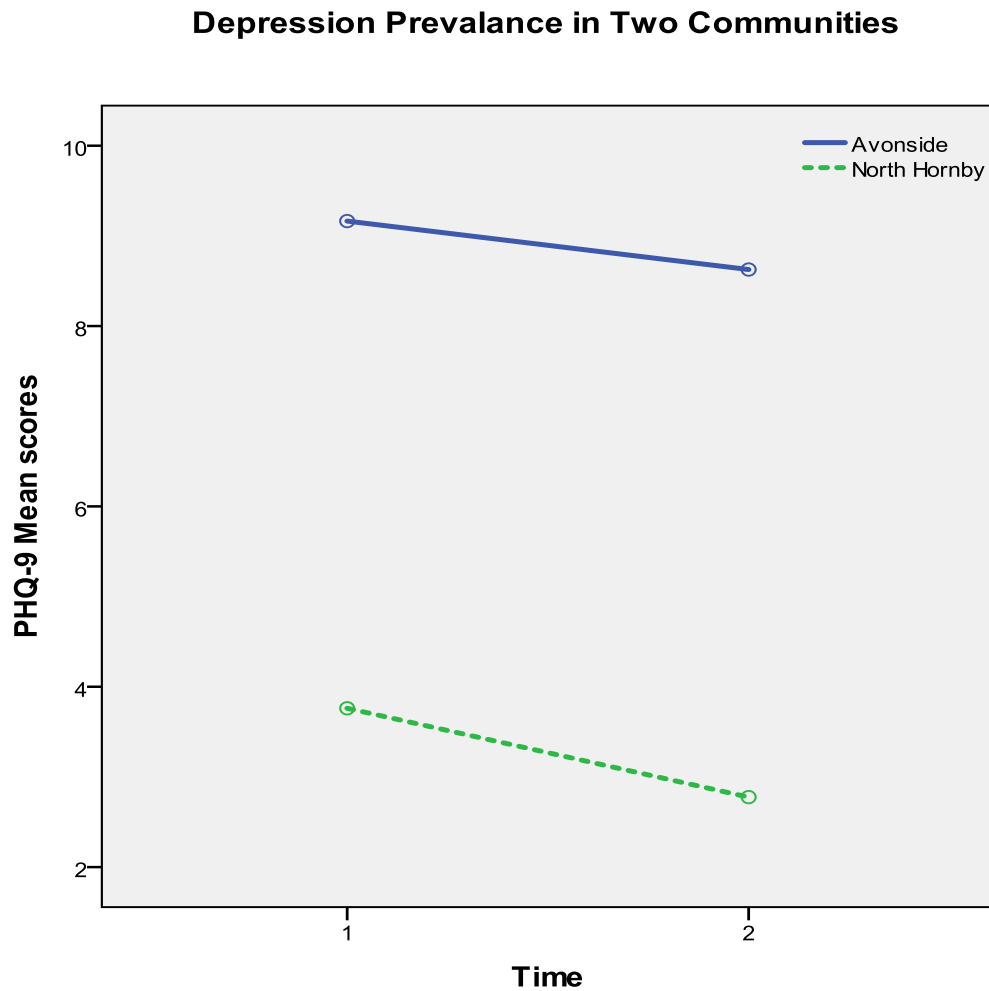**APPENDIX H   INTERACTION ACROSS TIME WITH DEPRESSION**

Depression Prevalance in Two Communities

Figure 1. Main effect interaction at time 1 and time 2 with depression

APPENDIX I   INTERACTION BETWEEN TIME AND LOCATION
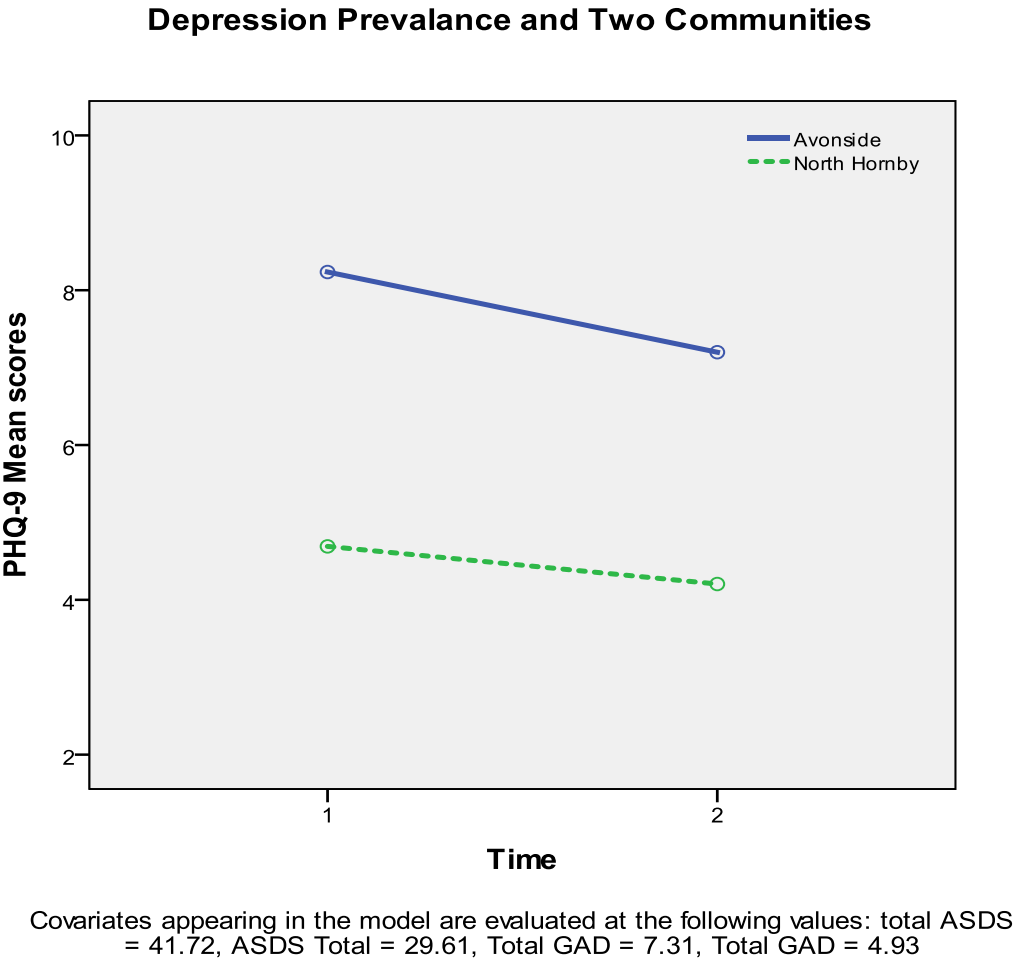

Covariates appearing in the model are evaluated at the following values: total ASDS = 41.72, ASDS Total = 29.61, Total GAD = 7.31, Total GAD = 4.93

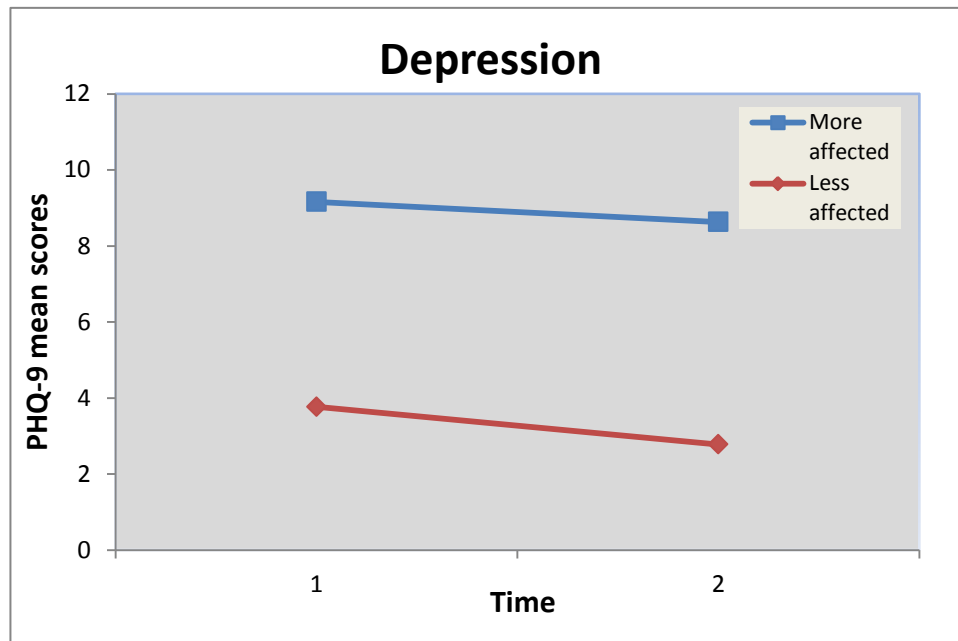*Figure 1*. The interaction between time and location with acute stress and anxiety with depression

APPENDIX J   DISTRIBUTION OF SCORES ON PHQ-9 MEASURE

Figure 1. Depression across two locations with the PHQ-9 measure

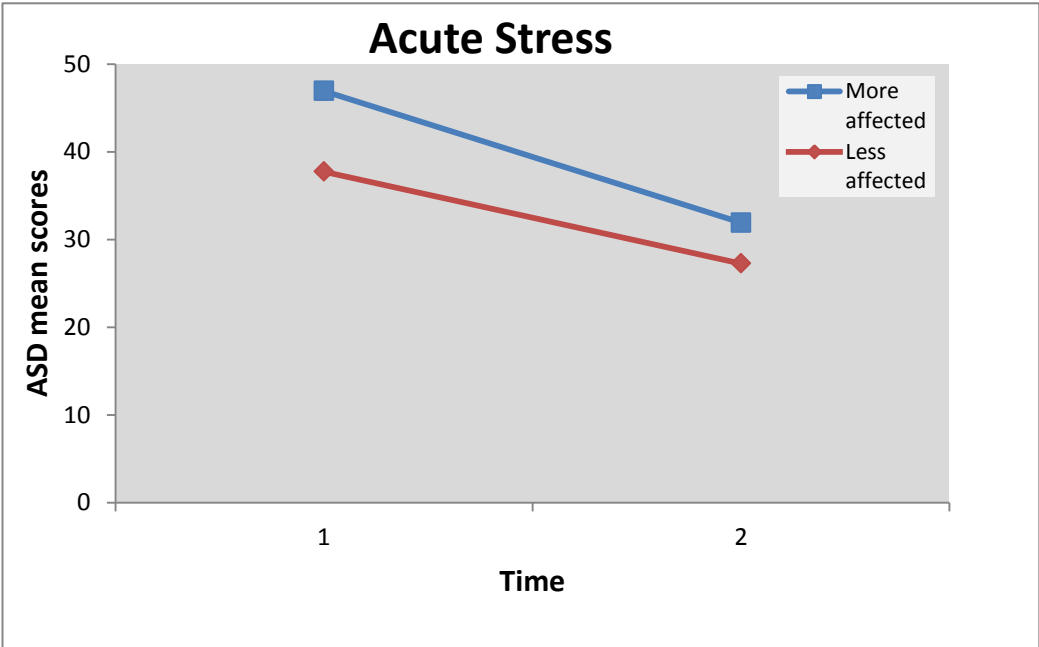**APPENDIX K   DISTRIBUTION OF SCORES ON MEASURES ASD AND**

GAD-7

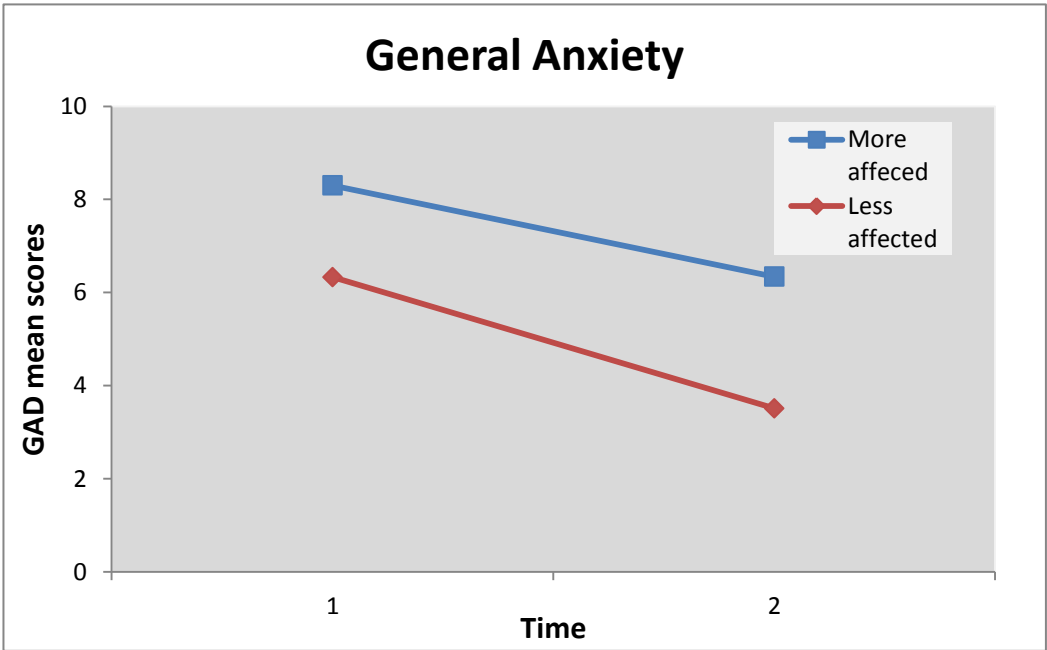*Figure K1.* Acute Stress across two locations with the ASD measure

Figure K2. General Anxiety across two locations with the ASD measure