Changes in preparedness and earthquake risk perception: Lessons from the 2010 and 2011 Canterbury earthquakes

John McClure [1], David Johnston [2],

Liv Henrich [3]

1, 3 Victoria University of Wellington

2. Massey University / GNS(Science), Joint Centre for Disaster Research

Report for EQC

GNS Science, Victoria University of Wellington

Acknowledgments: We thank Charlotte Gutenbrunner, Tess McClure, Peter Ranger, and Justin Velluppillai for assistance in collecting the data and Sana Oshika for entering data and assistance with the analyses. This research was funded by an EQC grant to John McClure and David Johnston.

Correspondence should be addressed to: John McClure, School of Psychology, Victoria University of Wellington, P. O. Box 600, Wellington, New Zealand. Email may be addressed to: john.mcclure@vuw.ac.nz

Abstract

This research examined changes in preparedness and judgments of the risk of earthquakes after the 2010-2011 Canterbury earthquakes in three cities: Christchurch (Canterbury), Wellington and Palmerston North. Christchurch citizens had direct experience of the earthquakes, and Wellington and Palmerston North citizens were chosen because their citizens were likely to have contrasting earthquake expectations. Many citizens in Wellington have long expected an earthquake; however, this is less likely in Palmerston North, where citizens are comparable to Christchurch citizens before the 2010-2011 Canterbury earthquakes. Participants judged the likelihood of an earthquake before and after the Canterbury earthquakes for their own city, for the rest of New Zealand, and with participants in Wellington and Palmerston North, for Canterbury. Participants reported their preparations before and after the earthquakes and their reasons for this. Christchurch participants also reported damage suffered in the earthquake. In all three samples, expectations of an earthquake in Canterbury were low before the Canterbury earthquakes and rose significantly after that earthquake. Palmerston North expectancies of an earthquake in their own city rose after the earthquake, whereas Wellingtonians' expectancies of a local earthquake were high before the Canterbury earthquakes and did not rise after the earthquakes. Preparations increased after the earthquakes, particularly in Christchurch. The most frequent preparations were getting basic needs and equipment, but the greatest increase after the earthquake was in actions to mitigate damage. These findings clarify the effects of earthquakes and prior expectancies on preparedness and risk judgments about earthquakes inside and outside the directly affected region.

Changes in preparedness and earthquake risk perception: Lessons from the Canterbury earthquakes

For people to prepare for natural disasters such as earthquakes, they need to recognize the risk that the hazard poses to them. Thus it is important to understand what factors influence citizens' judgments of risk from these hazards. One factor is people's experience of those hazards, either directly or at a distance. When a natural disaster occurs, does it affect the risk judgments of those who live in the disaster region differently to people who live outside the region and who are vulnerable to the same types of disaster?

Research has shown that judgments of the probability of negative events such as disasters are subject to a range of factors, including optimistic biases in people's judgments about different sorts of events, and people's personal experience of these events.

Optimistic bias

Research on risk perception has shown that people often make biased appraisals about their own risk relative to others. Specifically, at least in Western cultures, many people display an optimistic bias where they view themselves as less likely to be harmed by future risks than other citizens (e.g., Weinstein, 1980). This unrealistic optimism can lead people to underestimate the likelihood that they will experience a negative event, such as an illness or a car accident.

Several studies have demonstrated that this optimistic bias can influence judgments in relation to natural disasters. Jackson (1981) found that the majority of respondents in cities that were prone to earthquakes believed they would not experience an earthquake, or that if they did, they would not suffer personal harm. Mileti and Darlington (1995) found that whereas 80% of respondents in an earthquake

risk zone believed an earthquake would occur where they lived in the next five years, most judged that they would not suffer injuries or loss to their property. A similar optimism has been found in relation to hurricanes (Sattler, Kaiser, & Hittner, 2000), and volcanic eruptions (Johnston, Bebbington, Lai, Houghton, & Paton, 1999). Spittal, McClure, Siegert and Walkey (2005) asked New Zealand citizens about their own prospects in an earthquake and the prospects of an acquaintance and an 'average other' person. Participants judged the likelihood of both personal harm and property damage across the three target persons. Consistent with previous research, respondents judged themselves to be less likely to suffer harm than an acquaintance. Interestingly, on the damage to property measure, they rated themselves *more* likely to experience damage than either an acquaintance or an 'average other', which suggests that financial loss is less susceptible to optimistic bias. Overall, however, these findings show that people tend to discount the likelihood that they will be personally harmed by natural disasters.

This optimistic bias may be compounded or attenuated by citizens' beliefs about the levels of risk that particular hazards pose in different regions. For example, in New Zealand, prior to the recent Canterbury earthquakes, citizens' estimates of the probability of an earthquake in Canterbury were likely to have been lower than for Wellington (Becker, 2010), which is widely known to be vulnerable to earthquakes due to its proximity to several major faults. However, earthquakes had happened in Canterbury previously during the relatively recent period of European settlement since the 1860s. Thus the 'objective' risk of an earthquake in Canterbury was serious, as has been borne out by recent events in 2010 and 2011 - two large earthquakes occurring in the region that caused huge damage and loss followed by a number of major aftershocks. Similarly, before the Kobe earthquake, the estimated probability

of an earthquake in the Kobe region was significantly lower than for Tokyo (Nakashima & Chusilp, 2003). Yet it was Kobe that experienced the earthquake and its damaging consequences.

A key problem in citizens' risk judgment is that people in regions that are deemed by seismologists to have a lower risk than other regions appear to think that they are not at risk at all – it appears that they think that the hazard will necessarily strike the higher risk region first. This pattern may be analogous to people's tendency to edit low frequency events as having zero probability (Slovic, Fischhoff, & Lichtenstein, 1982; Stone, Yates, & Parker, 1994). This inferential leap has been shown to be an inaccurate extrapolation from the risk probabilities in both Kobe and Christchurch, as well as many other examples. This line of reasoning can have disastrous consequences, because people living in cities deemed to be a lower risk may think they do not need to prepare.

The effect of experiencing a disaster

Personal experience of a natural disaster can reduce optimistic bias. Burger and Palmer (1992) showed that with students who experienced the 1989 Loma Prieta earthquake, optimistic bias about negative events was absent directly after the earthquake, but returned three months later. Following the 1994 Northridge earthquake, Helweg-Larsen (1999) similarly found a lack of optimistic bias in respondents; however, unlike Burger and Palmer's sample, optimistic bias in regard to earthquakes did not return five months later, when the respondents were surveyed again. This suggests that there was a longer reduction in optimistic bias as a result of the earthquake experience. This difference from Burger and Palmer's findings may reflect the fact that Burger and Palmer's items did not focus specifically on optimism about earthquakes.

Although experience of an earthquake does increase many citizens' judgments of risk, the outcome of a person's experience is also an important factor. Mileti and O'Brien (1992) found that in comparison with those who suffered loss, people who suffered no personal losses or injuries were more optimistic about the possible consequences of a future earthquake and were less likely to take warnings of aftershocks seriously. Mileti and O'Brien claimed that these participants showed a 'normalization bias', in that when they experienced no negative impacts from the first event, they thought they would not be affected by subsequent impacts.

The present research

These previous studies show that personal experience of an earthquake affects citizens' perceptions of earthquake risk in a region that has been struck by an earthquake. However, these studies include no comparisons of judgments of earthquake likelihoods for people who have experienced an earthquake with others outside the region. Thus there is a gap in research on the effects of personal experience on risk judgments for those inside and outside the affected area. Yet some effects are likely to occur. For example, the Chernobyl disaster changed American citizens' perceptions of risks of nuclear energy (Reve, 2011), and the recent Japanese nuclear disaster triggered by a tsunami had similar effects on German citizens and the German Government's policy on nuclear power plants (Spiegel online, 2011).

The present research programme addresses this issue. The first study was performed following the earthquake in September 2010 in Darfield, Canterbury, near Christchurch city, New Zealand (magnitude 7.1 on the Richter scale) (McClure, Wills, Johnston, & Recker, 2011). This study compared the judgments of citizens in Christchurch, the largest urban area affected by the earthquake, with citizens in two other New Zealand cities: Wellington and Palmerston North. These two latter cities

are relatively distant from the earthquake and their citizens did not experience the earthquake first hand. Many citizens in Wellington have long expected an earthquake, due to civil defence warnings and commentaries in the mass media that focus on Wellington (e.g., Aftershock, 2008). However, this is not the case in Palmerston North. The Palmerston North sample was chosen because it is comparable to Christchurch before the Canterbury earthquakes, where most citizens did not expect an earthquake (Becker, 2010), but where seismologists knew that there was a possibility that there could be a major earthquake.

Participants judged their recall of earthquake likelihoods prior to the 2010 Darfield earthquake and following the same earthquake in regard to their own city, the rest of New Zealand, and with Wellington and Palmerston North participants, for Canterbury. In all three cities, expectancies of another earthquake in Canterbury were higher following the Darfield earthquake than before the event; however, post-earthquake expectancies were higher for Christchurch citizens than the other two groups. Expectancies of the probability of a local earthquake rose in Palmerston North but not in Wellington, where earthquake expectancies were already high. Expectancies of the probability of a local earthquake in another part of New Zealand also rose.

The study also showed that Wellington and Palmerston North participants who knew people in Christchurch judged the future earthquake risk in Canterbury higher than those who did not; this issue has little previous research. In contrast with previous findings, (e.g., Mileti and O'Brien, 1992), Christchurch participants who suffered damage in the earthquake did not judge the future likelihood of another earthquake in Canterbury as higher than those who did not.

The recent study was an extension of McClure et al.'s (2011) study and examined similar issues in relation to risk perceptions. However, it was carried out after the February 20l1 Canterbury earthquake which was shallower and closer to Christchurch than the Darfield earthquake, and was much therefore more damaging than the Darfield earthquake. In addition, many questions that used qualitative response formats in McClure et al.'s study were replaced by quantitative response formats, based on the responses to the earlier study. The study examined changes in earthquake expectancies following the February earthquake, in relation to a range of relevant variables.

Method

Participants

The participants completing the questionnaire were 294 residents from three cities in New Zealand: Christchurch, Wellington and Palmerston North. For the Christchurch sample, to gain a sample of the general population, participants were recruited at a popular market in Riccarton, central Christchurch on a Sunday. This sample consisted of 104 participants (gender: male = 34, female = 46, not stated = 24), with a median age of over 50 years, and a mean of 0.74 children per household.

The Wellington sample consisted of 91 participants (male = 31, female = 43, not stated = 17), whose median age was 21-30, with a mean of 0.92 children per household. Data was collected at the food market in downtown Wellington, and at lunchtimes in a popular urban park over three days. For the Palmerston North sample, 101 participants were recruited at an outdoor market (male = 28, female = 57, not stated = 16), with a median age of under 20 years, and a mean of 1.28 children per household. In all three cities, participation was voluntary and anonymous, and a chocolate bar was offered in appreciation of their participation.

Materials/Procedure

The questionnaires measured the perceived likelihood of an earthquake using measures based on McClure et al.'s (2011) study (See Appendix 1). The questionnaire included six items assessing earthquake likelihood, two of which asked how likely it was that a big earthquake would occur in or near Christchurch *before* and *after* the Canterbury earthquakes. Two items elicited the perceived likelihood of an earthquake occurring in Wellington (for Wellington and Christchurch participants) or Palmerston North (for Palmerston North participants), *before* and *after* the earthquakes. Two items assessed the likelihood of an earthquake happening in another part of New Zealand. Responses were given on a 5 point Likert Scale, with endpoints labelled 'Not at all likely' and 'Very likely'.

Related questions asked: 'Did you expect an event such as the Canterbury earthquakes to happen in your lifetime?' Response options: 'Yes/No'; and 'Has the risk of an earthquake become more real or plausible to you since the Canterbury earthquakes?' Response options: 'Yes/No' and 'If you previously thought an earthquake near Christchurch was unlikely, why was that?' with five causal attributions for their beliefs based on the open-ended responses found by McClure et al. (2011).

All versions of the questionnaire asked 'Before the earthquakes, were you aware of any information about how to prepare for a possible earthquake?' Response options: Yes, not sure, no. Where did you see this information (TV/Print/other); 'If you were aware of this information, and did you regard it as relevant to you?' Response options: Yes, some relevance, no.

Questions relating to preparation asked: 'Before the earthquakes, had you made any preparations specifically for an earthquake?' Response options: Yes /no; 'If

you said **YES** to the previous question, please list these preparations': followed by five types of preparation, and 'If you **did** make any preparations for an earthquake, what is the main reason'? followed by five reasons [See Appendix 1]. Parallel questions were asked if people did not prepare. A similar set of questions was asked in regard to preparations since the earthquakes and their plans to prepare in the future.

In addition to these items, the Christchurch survey asked: 'Did you incur a lot of damage in the earthquake?' (Yes/no) and 'If there is one thing you wished you'd done before the earthquake, what is it? Followed by five options (Circle one). The Wellington and Palmerston North questionnaires asked: 'Did you know anyone close to you who lives in Christchurch?' Response options: Yes/No.

A question asked if there were any other comments that participants would like to make, followed by optional questions about demographic information: gender, age, number of dependent children in the household, and their suburb. The questionnaires were administered seven months after the damaging February 2011 earthquake; this was three months after the most recent major aftershock in June 2011.

Results

Judged likelihood of an earthquake before and after the earthquake

Figure 1. The perceived likelihood of an earthquake occurring in or near Christchurch before and after the Canterbury Earthquakes. (1= not at all likely, 5 = very likely)

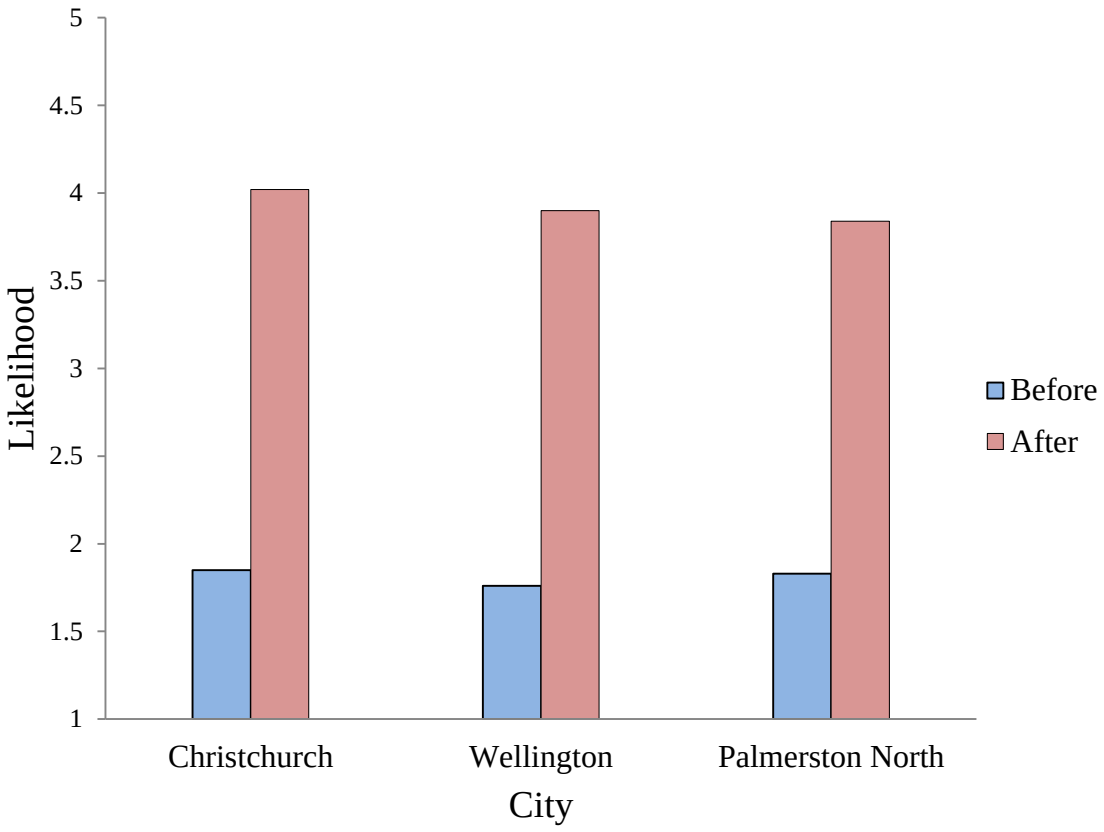


Figure 1 shows the data for expectancy of an earthquake in occurring in or near Christchurch. These data were analysed with a 3 (Participant City: Christchurch, Wellington, Palmerston North) x 2 (Time: before, after the earthquake) mixed design analysis. This showed a main effect for Time, $F(1, 293) = 732.88$, $p<.001$, $\eta^2 = .71$, in that participants' expectancies of an earthquake near Christchurch were higher after the Canterbury earthquakes ($M = 3.92$) than before the earthquakes ($M = 1.81$).

There was no interaction between City and Time, and no main effect for city, indicating that the effects were the same across the three cities.

Figure 2. The perceived likelihood of an earthquake in Wellington and Palmerston North before and after the Canterbury Earthquakes for participants in the three cities (1= not at all likely, 5 = very likely)

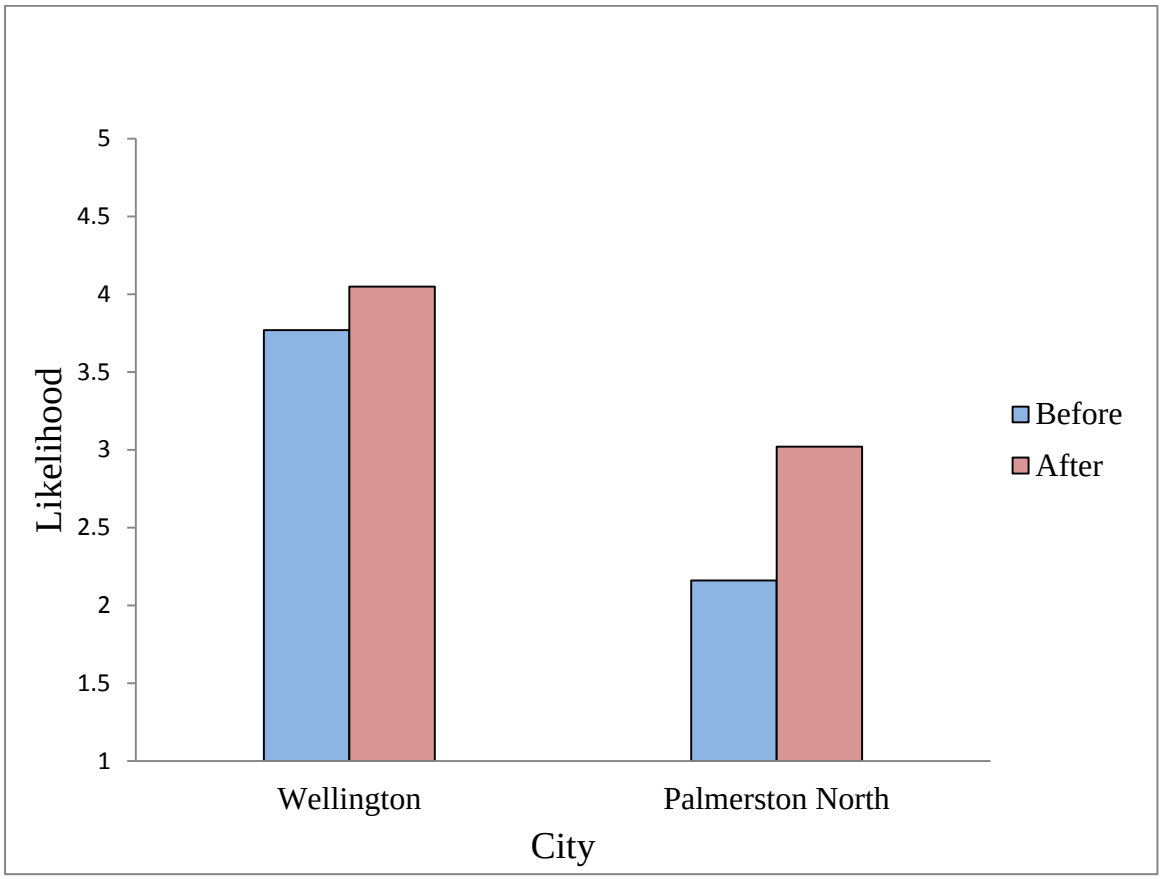


Figure 2 shows the data for expectancy of an earthquake in the Wellington and Palmerston North. These data were analysed by a 3 (Participant City: Christchurch, Wellington, Palmerston North) x 2 (Time: before, after the earthquake) mixed design analysis. An earthquake in these cities was judged more likely after the Canterbury earthquakes (M = 3.68) than before (M = 3.16), as shown by a main effect for Time, $F(1, 291) = 71.37$, $p<.001$, $\eta^2 = .19$, and was judged more likely in Wellington (M =

3.81) than Palmerston North (M = 2.59), as shown by a main effect for City, F(2, 291) = 75.16, p<.001, η^2 = .25. These main effects were qualified by an interaction between City and Time, F(2, 291) = 7.81, p<.001, η^2 = .05, indicating that that the increase in the perceived likelihood of an earthquake was greater in Palmerston North than in Wellington.

Figure 3. The perceived likelihood of an earthquake in another part of New Zealand before and after the Canterbury Earthquakes for participants in the three cities (1= not at all likely, 5 = very likely)

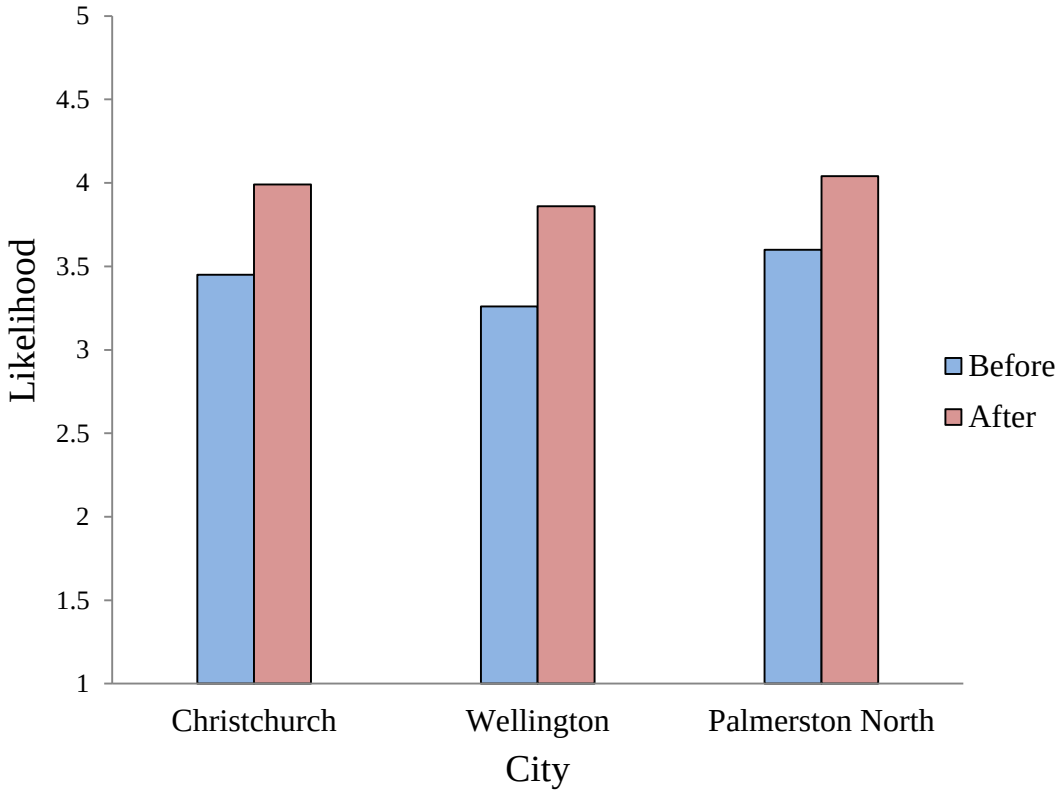
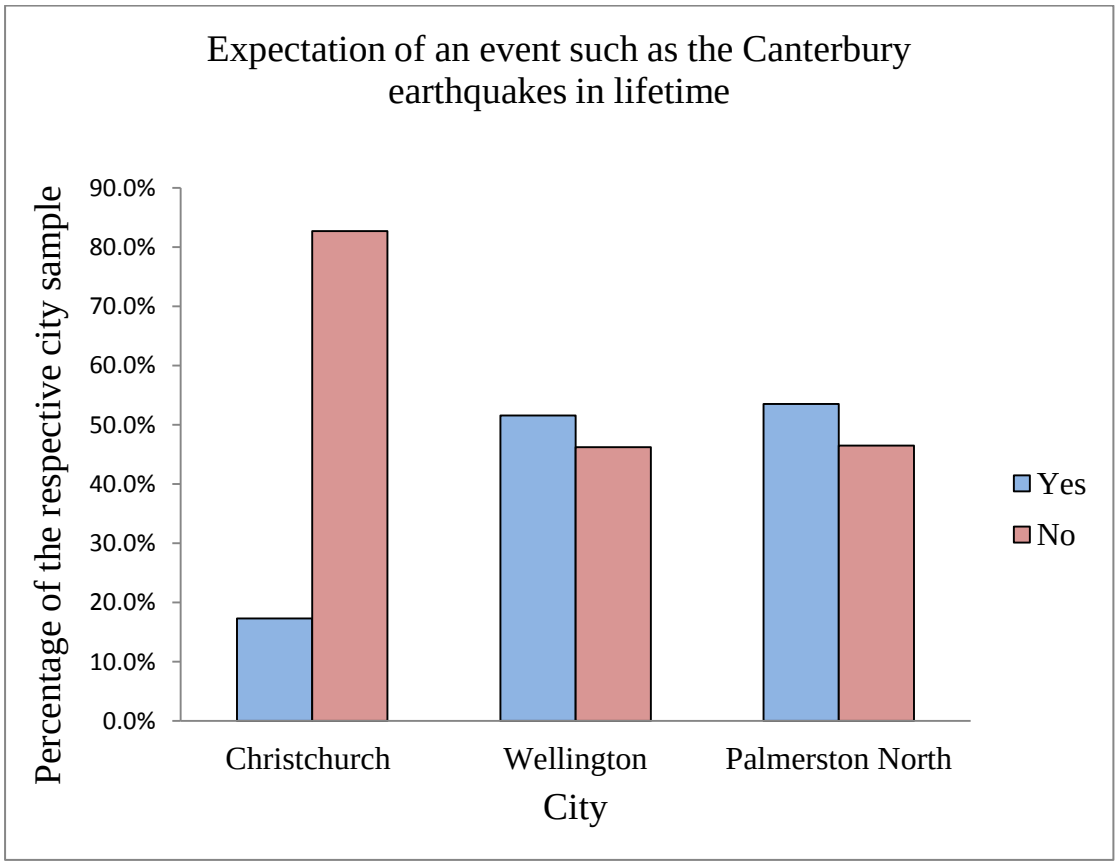


Figure 3 shows the data for expectancy of an earthquake in another part of New Zealand. These data were analysed with a 3 (Participant City: Christchurch, Wellington, Palmerston North) x 2 (Time: before, after the earthquake) mixed design analysis. This earthquake expectancy was higher after the Canterbury earthquakes

than before, as shown by a main effect for Time, $F(1, 291) = 61.52$, $p<.001$, $\eta^2 = .17$. There was no main effect for City, and no interaction between City and Time.

Lifetime Expectancy and reality of risk

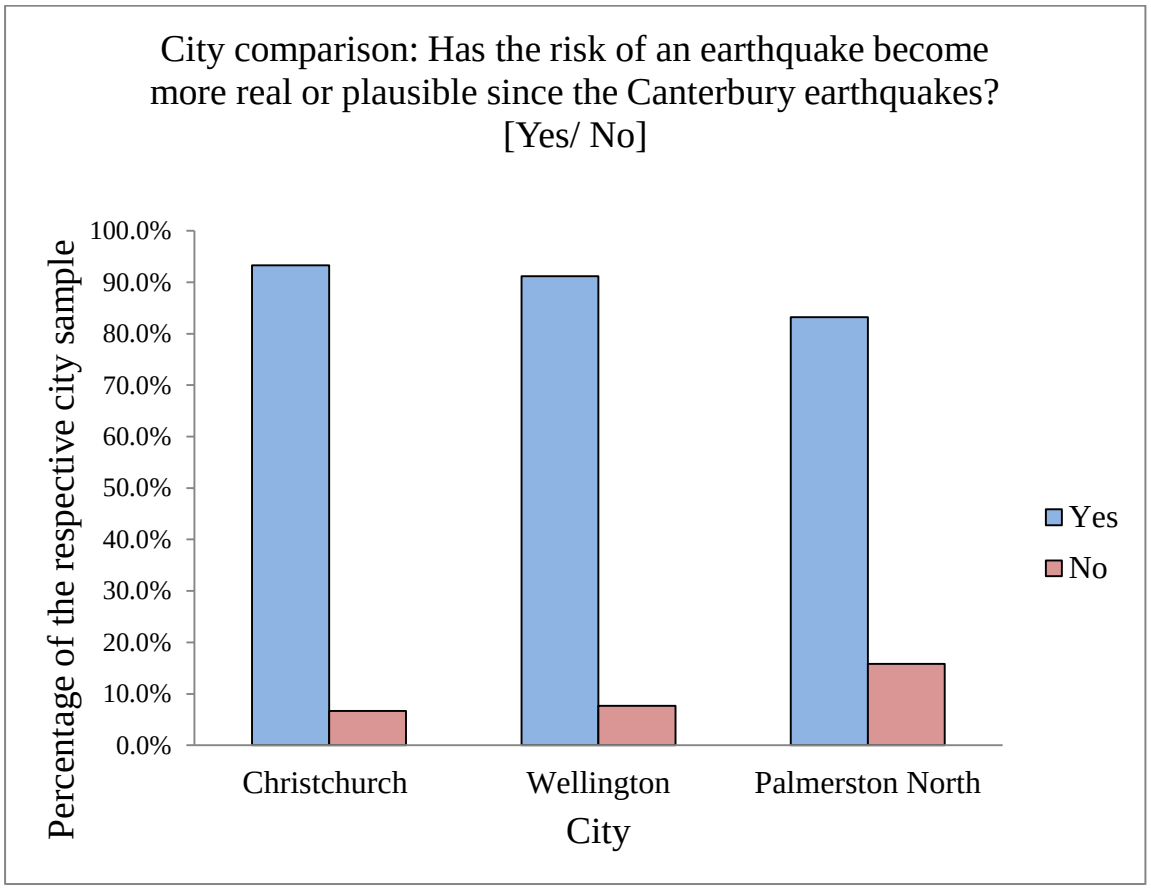
Figure 4: Expectation of an event such as the Canterbury earthquakes in your lifetime



On the question of whether participants thought *before* the Canterbury earthquakes that an event such as the earthquakes would occur in their lifetime, there was a significant association between participant city and expectancy, x^2 (2) = 35.86, $p < .001$ (See Figure 4). Over half of the participants in Wellington (51.6 %) and Palmerston North (53.5%) claimed they believed such an event would happen in their lifetime, whereas the percentage was much lower for Christchurch (17.3%) (See

Figure 4). This association shows that the City variable has a moderate relationship with lifetime expectancy of a disaster (V = .349).

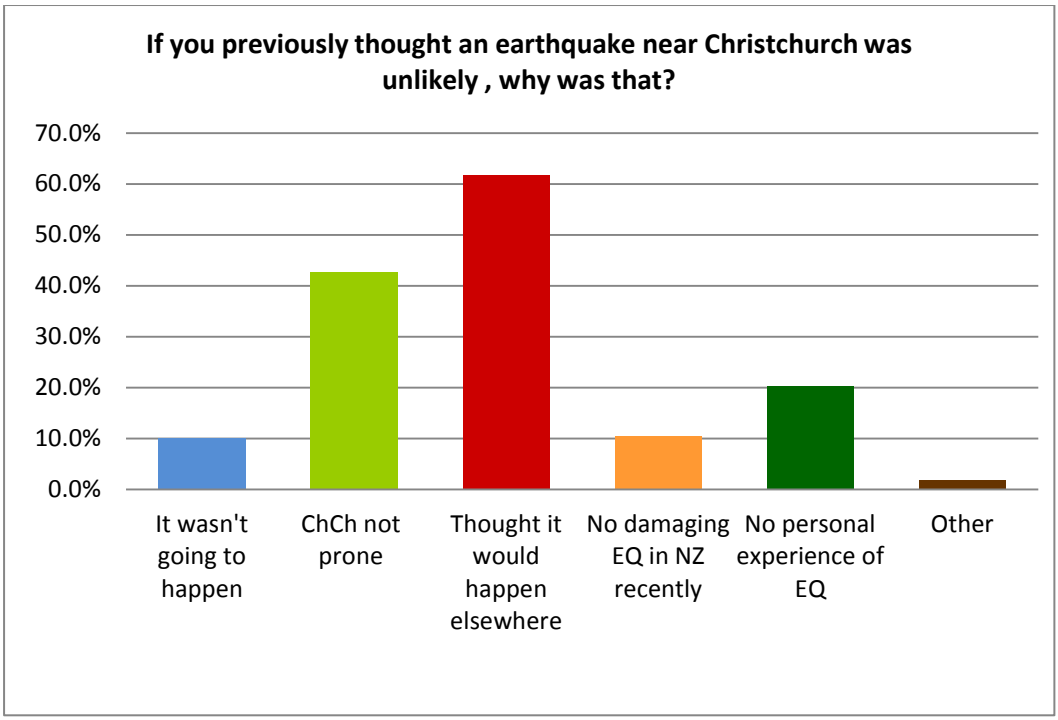
Figure 5: Has the risk of an earthquake become more real or plausible since the Canterbury earthquakes?



The large majority of participants in all cities, Christchurch (93.3%), Wellington (91.2%) and Palmerston North (83.2%), claimed that the risk of an earthquake had become more real for them since the Canterbury Earthquakes (See Figure 5). The proportion did not differ significantly by city (Christchurch, Wellington and Palmerston North), x^2 (2) = 5.61, p = .06.

Attributions for risk judgments about an earthquake near Christchurch

Figure 6: Participants' attributions for why they previously thought an earthquake near Christchurch was unlikely



The most frequent attributions for believing an earthquake was not going to happen near Christchurch were that people thought it would happen elsewhere and that Christchurch was not prone to an earthquake. Less frequent reasons were that they had no personal experience of an earthquake, there had been no damaging earthquake in New Zealand recently, and they believed an earthquake wasn't going to happen.

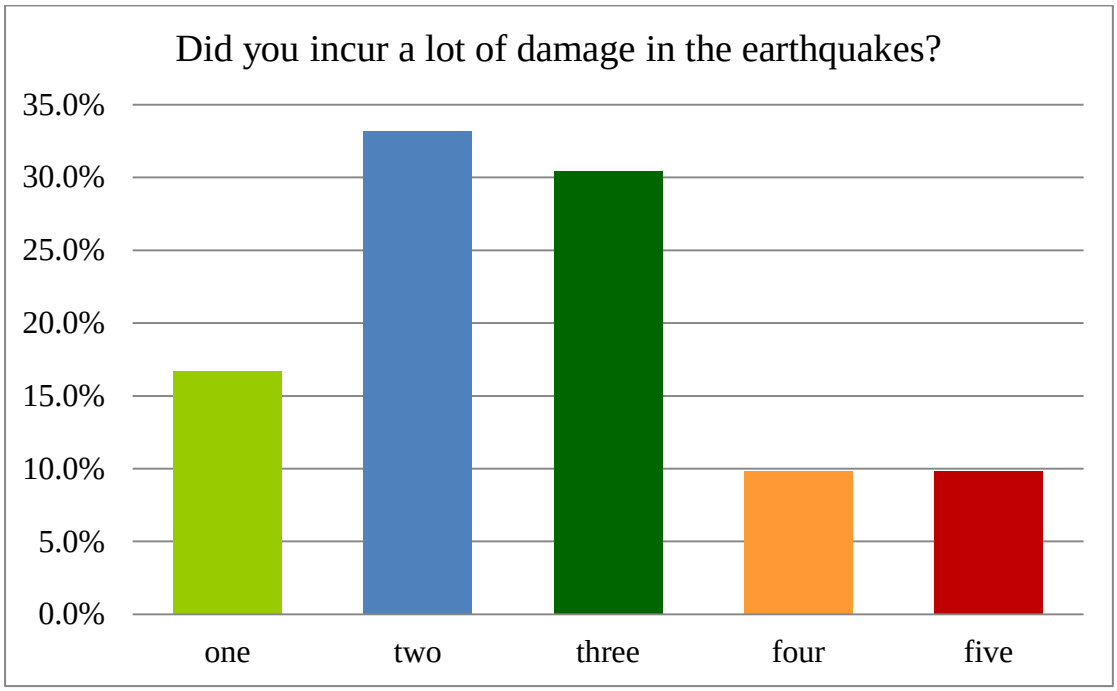
Earthquake Information: Awareness and judged relevance prior to Earthquake

With regard to whether participants were aware of information about earthquakes before the Canterbury earthquakes, there was a difference in whether participants in the three cities were aware of information about earthquakes, before the Canterbury earthquakes, x^2 (4) = 16.9 $p < .01$ (V= .172). The percentage of participants aware of this information was lower in Christchurch (69.7%) than

Wellington (86.7%) and Palmerston North (75.3%). There was, however, no difference between participants in Wellington (40.9%) Palmerston North (38%) and Christchurch (37.9%) who saw the information as relevant, x^2 (4) = 3.87, p = .42.

Did citizens who incurred damage see the risk differently?

Figure 7. Severity of damage experienced by Christchurch citizens (percentages) (1 = no damage; 5 = extensive damage)



The proportion of Christchurch citizens who incurred damage is shown in Figure 7. Most Christchurch participants suffered minor or moderate damage. Because of the low numbers at the extremes of the scale, participants were combined into two cells: low damage [ratings of 1 or 2), and moderate to high damage (ratings of 3-5). A one way ANOVA showed that there was a non-significant trend for those Christchurch citizens who incurred more damage to judge the risk of another earthquake in Canterbury higher (M = 4.17), than those who did not incur much damage (M = 3.82), F(1, 100) = 2.82, p = .096.

The effect of knowing persons in Christchurch

The proportion of participants who knew someone close in Christchurch was 74.7% in Wellington and 58% in Palmerston North. A chi square test found a significant difference in these proportions in Wellington and Palmerston North, x^2 (1) = 5.94, p<.05. (V= .176). A one way ANOVA showed that those in Wellington and Palmerston North who knew people close to them in Christchurch saw the risk of another earthquake in Canterbury as no higher (M = 3.90) than those who did not (M = 3.89), F(1, 174) = 0.01, ns. However, interestingly, they did see the risk of another earthquake in their own city as higher (M = 3.62) than those who did not know anybody in Christchurch (M = 3.24), F(1, 189) = 5.95, p < .02 η^2 = .03. In addition, Wellington and Palmerston North participants who knew people who incurred damage in the earthquakes judged the risk of a future earthquake in their own city higher (M = 3.72) than those who did not know anyone who incurred damage (M = 3.37), F(1, 174) = 5.32, p<.05, η^2 = .03.

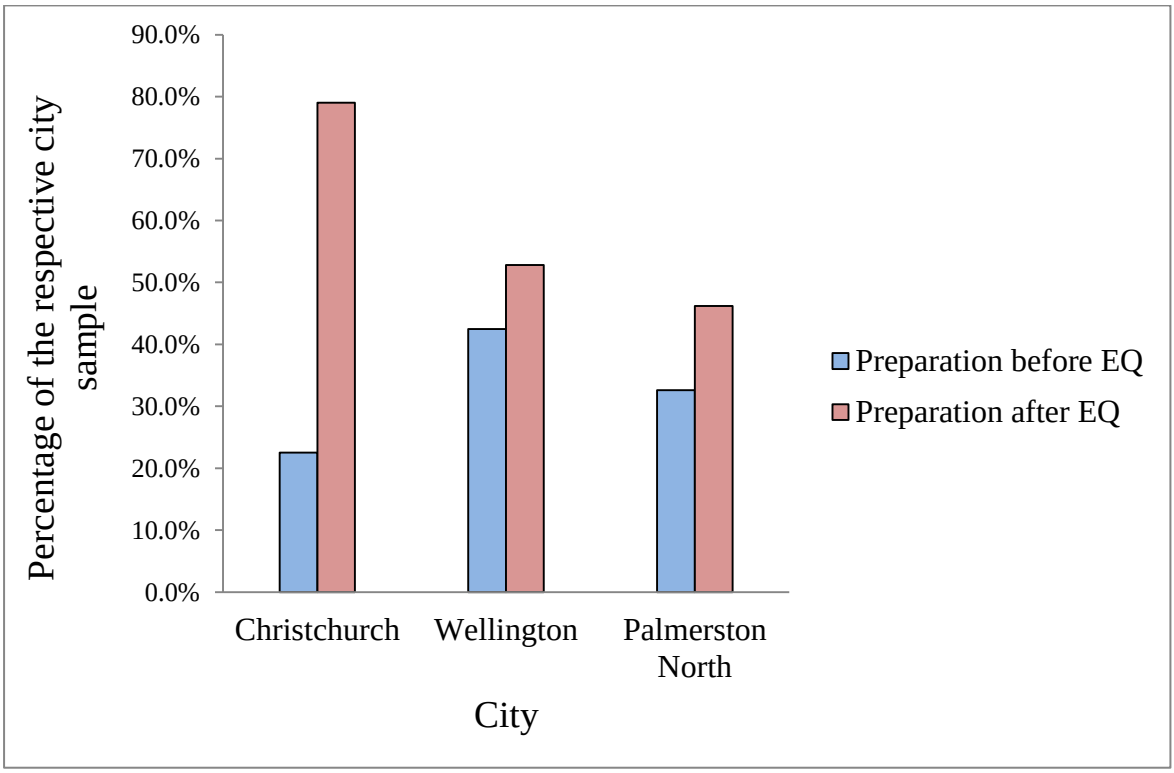
Preparation

Approximately 80% of Christchurch citizens reported preparing since the earthquakes (Figure 8), whereas approximately 50% of Wellington and Palmerston North citizens reported preparing since the earthquakes. A chi square test showed that there was a significant difference between the levels of post- earthquake preparation in the different cities, x^2 (2) = 24.29, p < .05, showing that the proportion preparing since the earthquake rose significantly more in Christchurch than in Wellington and Palmerston North.

Further tests found specific differences in preparation in the three cities before and after the earthquake. Before the earthquakes, significantly more citizens reported

preparing in Wellington (42.5%) than in Christchurch (22.5%), x^2 (2) = 9.26, $p < .05$, (V= .221); whereas after the earthquakes, more Christchurch citizens (79%) reported preparing than Wellingtonians (52.8%), x^2 (2)= 14.54, $p < .05$, (V= .277). Before the earthquakes, there was no difference in the proportion of citizens who reported preparing in Palmerston North (32.6%) in Christchurch (22.5%), whereas after the earthquakes, more people reported preparing in Christchurch (79%) than in Palmerston North (46.2%). x^2 (2) = 22.24, p< .05, (V=. 339).

Figure 8. Level of preparation in each city before and after the earthquakes



Christchurch citizens who reported preparing since the earthquakes (M = 4.06) saw the risk of a future earthquake in Christchurch as no higher than those who did not report preparing (M = 3.76), $F(1, 98) = 1.29$, ns. Similarly, citizens in Wellington and Palmerston North who reported preparing since the earthquakes (M = 3.60) did

not see the risk of a future earthquake in their own city as any higher than those who did not report preparing (M = 3.43), $F(1, 180) = 1.02$, ns.

Which preparations had people made or not made – and why?

Figure 9 shows the types of preparations that citizens reported before and after the earthquakes. Before the earthquakes, the more frequent preparations reported were getting basic needs and basic equipment at about 30% each, followed by getting communications and logistics and planning, with about 13% each, followed by damage mitigation at 5%. Following the earthquakes, all types of preparation increased notably, but they held the same rank order to preparations before the earthquakes. However, the preparation that increased the most was damage mitigation - from 6% to 21%. Figure 10 show the data for each city.

Figure 9 Types of preparations BEFORE and AFTER the earthquakes

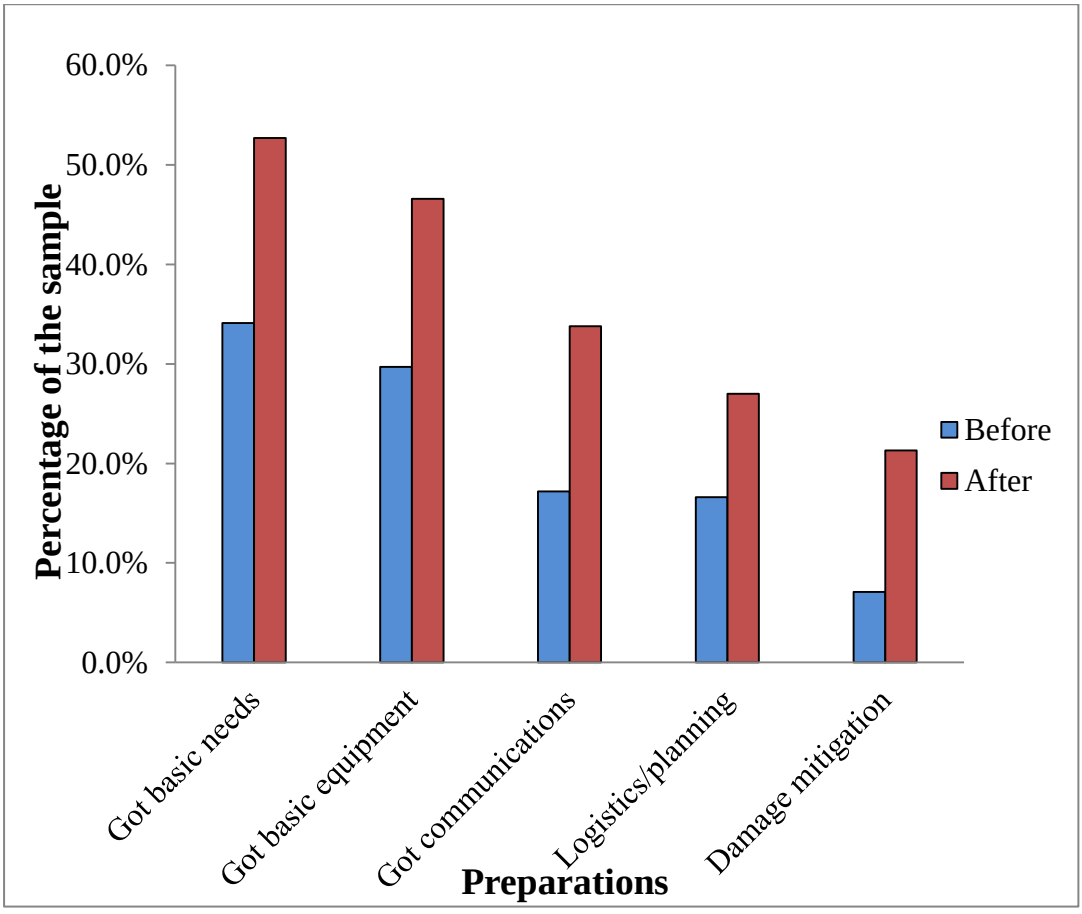
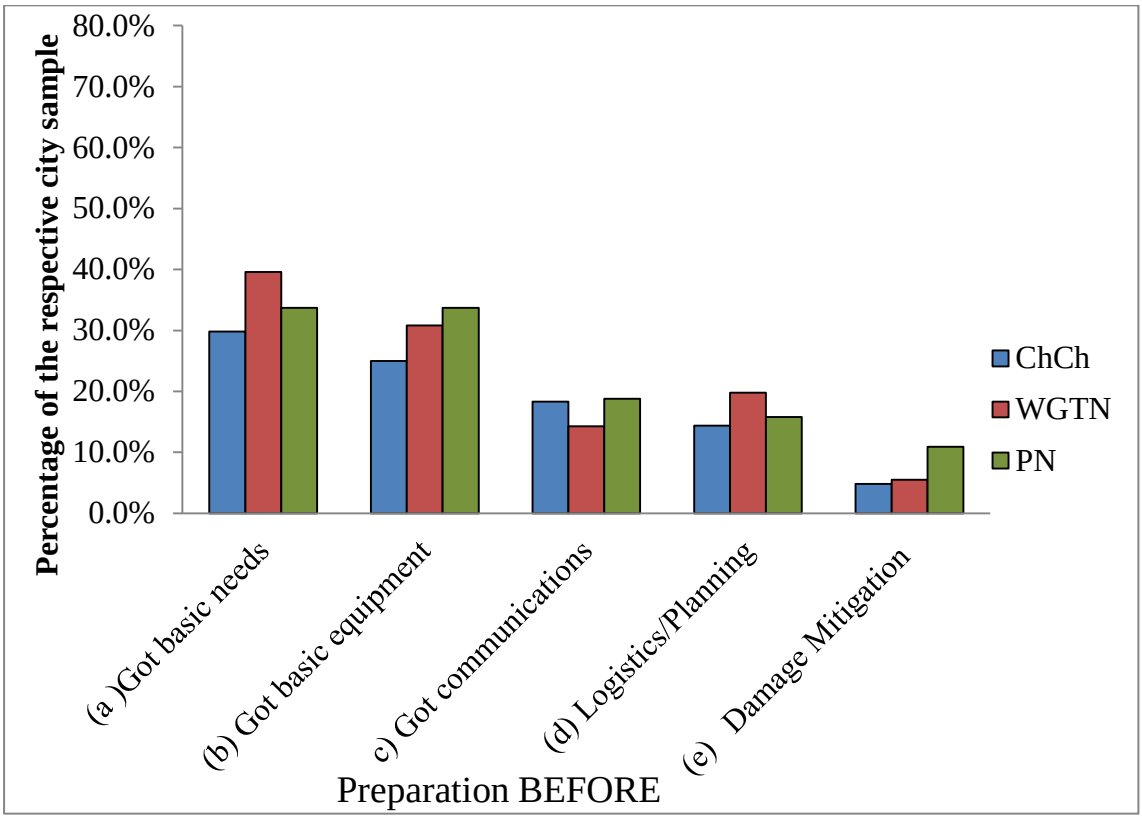


Figure 10a and 10b Type of preparation BEFORE and AFTER the earthquakes by city



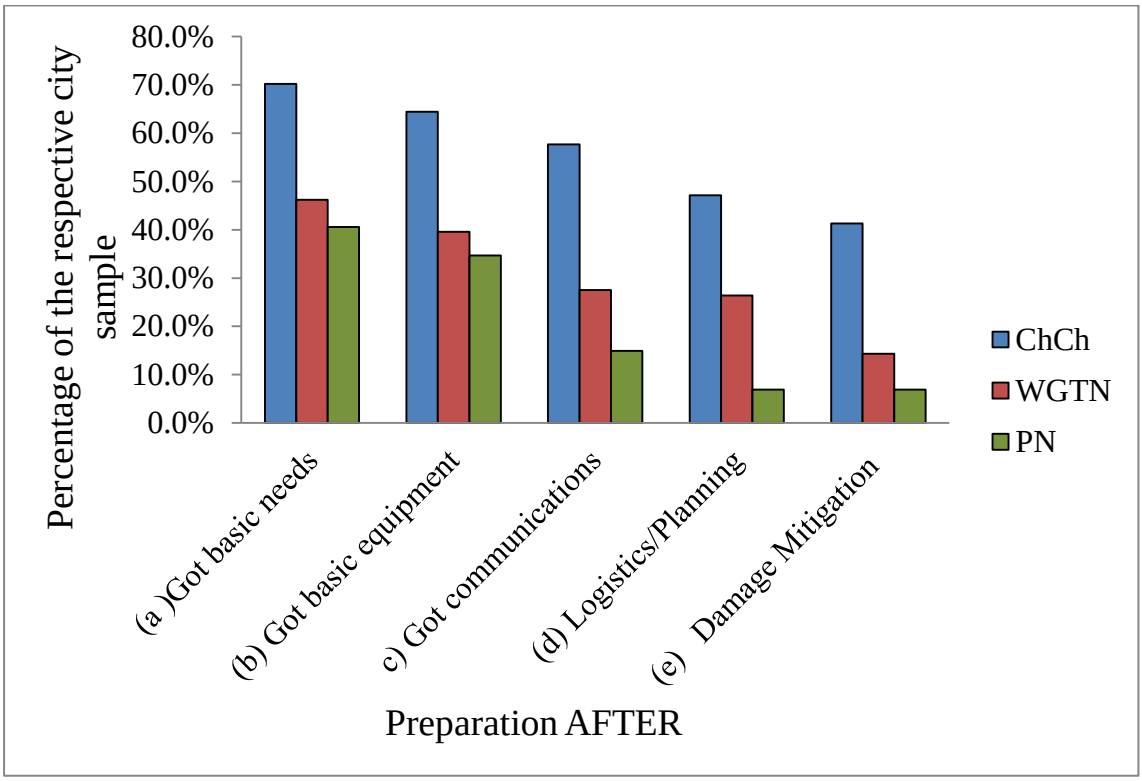


Figure 11. **Reasons [Attributions] for preparing before the earthquakes**

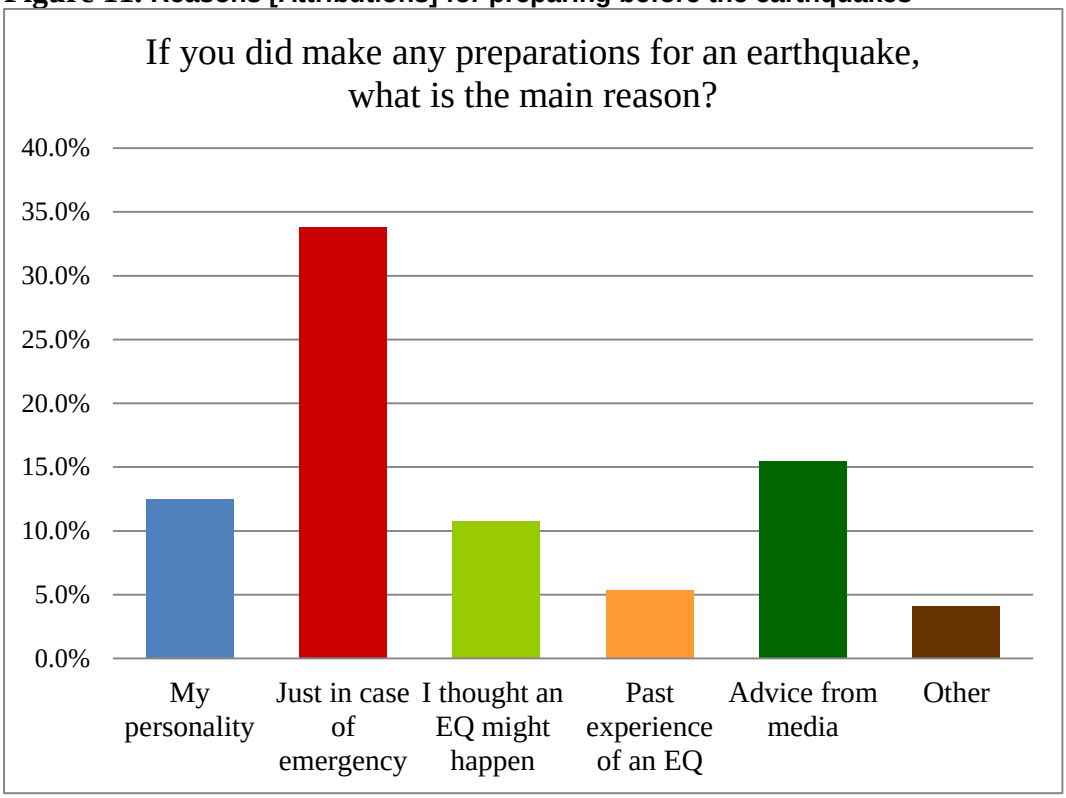
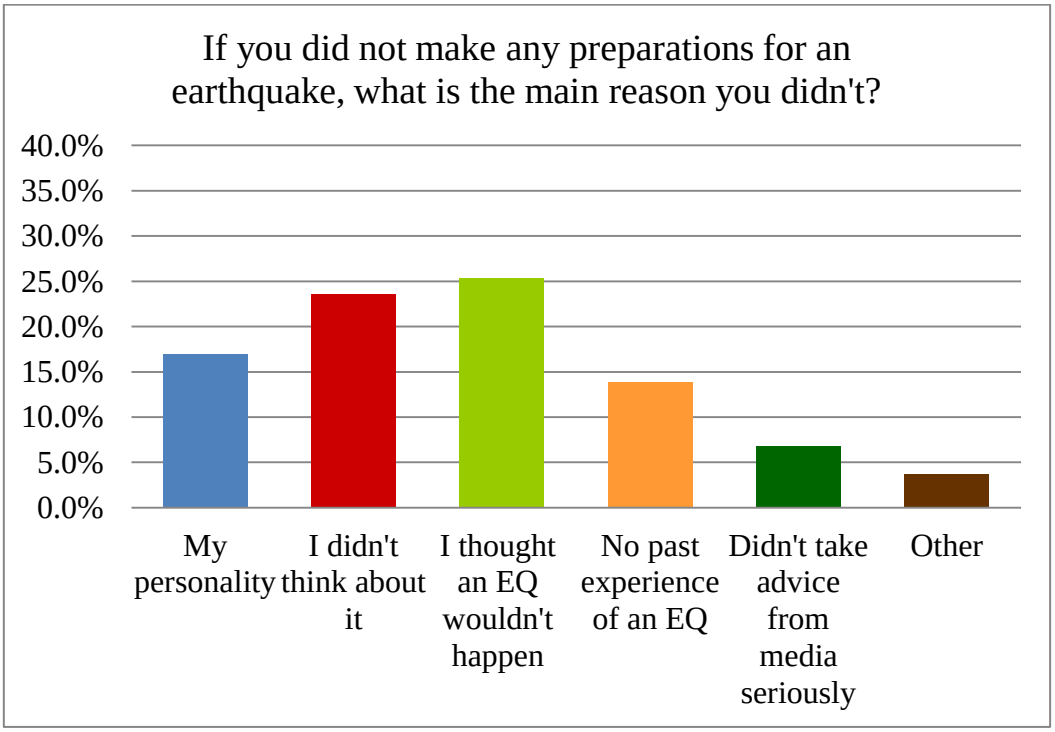


Figure 12. **Reasons [Attributions] for NOT preparing before the earthquakes**



Figures 11 and 12 show the reasons (attributions) participants gave for preparing or not preparing before the earthquakes. The most cited reason for preparing was 'just in case of an emergency', followed by advice from the media. The most cited reason for NOT preparing was 'I thought an earthquake wouldn't happen, followed by 'I didn't think about it'.

Figure 13. If there was one thing you wished you'd done before the earthquake, what is it? (Christchurch citizens only)

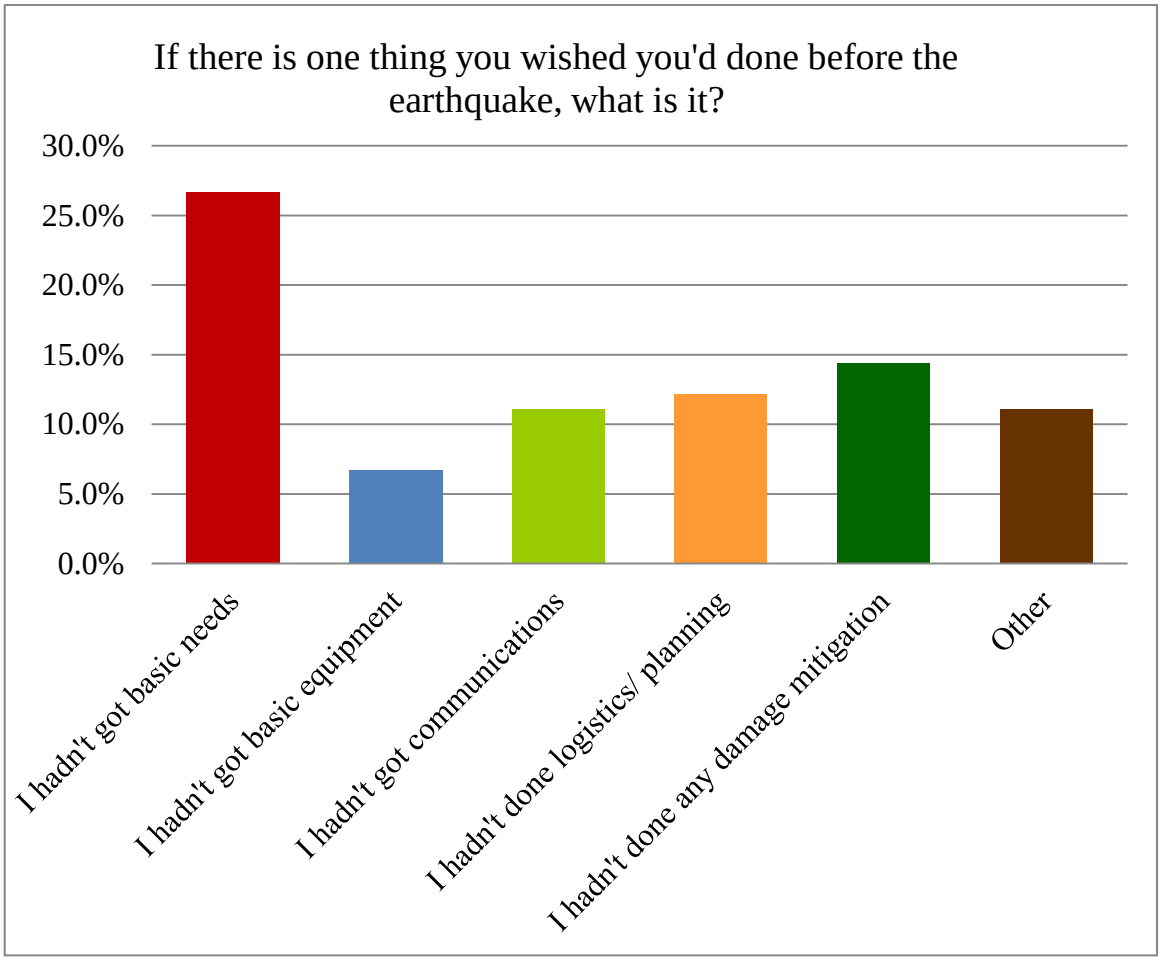


Figure 13 shows the Christchurch citizens' responses to the counterfactual question: If there was one thing you wished you'd done before the earthquake, what is

it? As in the preparedness questions, getting basic needs is selected the most, but in contrast with those questions, the second highest item they regretted was not taking any damage mitigation actions. Getting basic equipment fell from second on the preparation scale to bottom ranking on this scale.

Discussion

Changes in the perceived likelihood of an earthquake

There are several interesting findings in changes in perceived earthquake likelihood after the Canterbury earthquakes inside and outside the affected region. As expected, the perceived likelihood of an earthquake in Canterbury was low before the earthquake and rose significantly after the earthquake. This increase in the perceived likelihood of an earthquake in Canterbury was the same for participants in the affected city (Christchurch) as in the other cities.

In judgments of the likelihood of a future earthquake in Wellington and Palmerston North, there were interesting differences across the two cities. Whereas participants rate the likelihood of an earthquake in both cities higher after the Canterbury earthquakes, the increase is higher for Palmerston North than Wellington, where an earthquake was perceived almost as likely before the Canterbury earthquakes as after. However, the baseline level of judged earthquake likelihood for Wellingtonians was high before the earthquake. This result suggests that risk judgments not only reflect people's experience of an earthquake but also media communications about earthquake risk. Wellingtonians have been told frequently by both civic agencies and the news media that an earthquake is likely in their city, but this is not the case for citizens of either Palmerston North or Christchurch (Ronan, Johnston, & Paton, 2001; Becker 2010). The findings suggest the importance of civic

agencies communicating risk not only to citizens in cities thought to be at highest risk but also citizens in cities thought to have a lower (but still significant) probability of an earthquake. As in the case of this Canterbury event and the Kobe earthquake, earthquakes do not always happen in the zone that is seen as the most vulnerable.

The analyses on whether participants expected an earthquake in another part of New Zealand show that for citizens in all three cities, this expectancy increased after the Canterbury earthquakes. A key message for citizens from this earthquake is that earthquakes happen not only in known vulnerable cities like Wellington; they may happen elsewhere - in New Zealand and other countries such as Japan (Kobe) and USA (Eastern Washington). This recognition of the risk may not be sufficient on its own to motivate citizens to undertake preparedness activities, but it is a likely prerequisite of voluntary preparation.

Other findings showed that Christchurch participants who suffered damage in the earthquake saw the probability of another earthquake in the region as no higher than those who suffered no damage, a finding that contrasts with that of Mileti and O'Brien (2002). This result may reflect a ceiling effect, as most Christchurch participants saw another earthquake in their region as likely. Interestingly, citizens living outside Christchurch who had acquaintances in Christchurch who suffered damage judged the likelihood of another earthquake in their own region higher than those who had no acquaintances there. This is a novel finding. The finding that citizens who prepared saw the risk of another earthquake as no higher than those who did not prepare is consistent with past research (e.g., Spittal, McClure, Walkey, & Siegert, 2008), and is a reminder that recognition of the risk is necessary but not sufficient on its own to get people to prepare. Voluntary actions are based on other factors such as the perception that preparation will make a difference.

A limitation in the findings on risk judgments is that the judgments of earthquake risk before the earthquakes were recall judgments that could be subject to memory biases. For example, people may revise their recall judgments in line with current expectancies in a form of the hindsight bias. However, Becker's (2010) data suggest that these recall judgments were consistent with risk judgments for the region collected before the earthquakes. In addition, revising recalled judgements in line with current judgments would be likely to diminish rather than augment the difference between the judgments of earthquake likelihood before and after the earthquakes.

Preparation – before and after

The results show a number of interesting findings in regard to preparation. Significantly more Wellington citizens reported being prepared before the earthquakes than citizens in the other cities, whereas significantly more Christchurch citizens reported preparing after the earthquakes. This testifies to the effect of experiencing an earthquake - a finding consistent with previous findings with earthquakes and other hazards. But the finding that more Wellingtonians reported preparing before the earthquakes than citizens in the other cities suggests that the news media and possibly other agencies focused on the risk in Wellington as the expense of other cities. Many citizens were unaware that Christchurch was exposed to the risk of the earthquake or that the city had in fact experienced two significant earthquakes since European settlement (i.e., about 1850), which is relevantly recent in geological terms. Clearly New Zealand citizens need to know that the risk from earthquakes does not lie solely in Wellington.

It is noteworthy that although all types of preparation increased after the earthquakes, the category that increased the most proportionately was actions to mitigate damage. Furthermore, in response to the question: 'If there was one thing

you wished you'd done before the earthquake, what is it?'**,** Christchurch citizens cited getting basic needs first and not having taken actions to mitigate damage as second highest. As noted by Spittal et al. (2008), preparedness can be grouped in to two main categories: survival actions and actions to mitigate damage. Civic programmes attempting to enhance preparedness tend to focus on the former but not the latter. This is an issue that needs to be addressed, as the Christchurch citizens found out to their regret.

The reasons (attributions) that citizens gave for preparing are also informative. Of those who *did* prepare, few said they expected an earthquake to happen, the most frequent reason being that they did so just in case of an emergency. Of those who did *not* prepare, the most cited reasons were that they never thought an earthquake would happen, they didn't think about it, and their personality. So there little difference between those who did and did not prepare in terms of believing an earthquake would happen. The main difference is that those who prepared recognised the possibility of an emergency whereas those who did not prepare didn't take these precautions and didn't think about it.

Changing people's beliefs and actions regarding earthquake risk

Previous research has shown that communications about damage from earthquakes can reduce people's fatalism about earthquakes and enhance their belief in the value of preparations (e.g., Cowan, McClure, & Wilson, 2002; McClure, Sutton, & Sibley, 2007; Spittal, Siegert, McClure, & Walkey, 2002). For example, the way messages about the hazard are framed influences people's attributions about the cause of damage (McClure & Hilton, 1998; McClure, White, & Sibley, 2009), and these attributions in turn affect people's perception that the causes can be prevented.

Unrealistic optimism in the form of underestimating the likelihood of negative events can be countered by messages that communicate that people in similar circumstances have taken steps to prepare for a hazard (Weinstein 1980). In addition to this general principle, one key implication of the present findings is the need to get people to understand that even if they *are* objectively at a lower risk than people in other cities in terms of earthquake probabilities, they should *not* use this comparison as a basis for their risk judgments. Instead, they should base their actions on the actual level of risk in their own region, even if that risk is lower in probabilistic terms than other regions, as was the case in Christchurch. Even when the probabilities are relatively low, the consequences when a major earthquake does occur can be devastating. In addition, experts' judged probabilities of earthquakes are based on known faults and do not take account of faults that remain undiscovered. So citizens should take account of whether they are in broad proximity to an earthquake region and not only whether there is a known local fault. Programmes to educate and motivate citizens should take these aspects of the hazard into account.

The findings on preparedness show not only that Christchurch citizens were underprepared but that Christchurch citizens most regretted that they hadn't got resources for their basic needs and hadn't taken action to mitigate damage. Many schemes to enhance preparedness focus on the former and not the latter, and this bias needs to be corrected.

Efforts to get citizens to prepare for earthquakes will be most effective if they use effective message backed up by incentives including community participation in risk management, insurance policies with excess levels that correspond to the risk, and robust legislation on building standards and land prone to liquefaction.

References

Aftershock. (2008). TV3 programme, New Zealand, 8 October 2008.

Becker, J. S. (2010). Understanding disaster preparedness and resilience in Canterbury: Results of interviews, focus groups and a questionnaire survey. GNS Science report 2010/50.

Burger, J. M., & Palmer, M. L. (1992). Changes in and generalization of unrealistic optimism following experiences with stressful events: Reactions to the 1989 California earthquake. *Personality and Social Psychology Bulletin, 18*, 29-43.

Cowan, J., McClure, J., & Wilson, M. (2002). What a difference a year makes: How immediate and anniversary media reports influence judgments about earthquake. *Asian Journal of Social Psychology, 5*, 169-185.

Helweg-Larsen, M. (1999). (The lack of) optimistic bias in response to the Northridge earthquake: The role of personal experience. *Basic and Applied Social Psychology, 21*, 119-129.

Jackson, E. L. (1981). Response to earthquake hazard: The West Coast of North America. *Environment and Behavior, 13*, 387-416.

Johnston, D.M., Bebbington, M.S., Lai, C.-D. , Houghton, B.F., & Paton, D. 1999. Volcanic hazard perceptions: Comparative shifts in knowledge and risk. *Disaster Prevention and Management*, *8*, 118-126.

McClure, J., & Hilton, D. (1998). Are goals or preconditions better explanations: it depends on the question. *European Journal of Social Psychology, 28*, 897–911.

McClure, J., Wills, C., Johnston, D., & Recker, C. (2011). How the 2010 Canterbury (Darfield) earthquake affected earthquake risk perception: Comparing

citizens inside and outside the earthquake region. *Australasian Journal of Disaster and Trauma Studies, 2011-2:* 3-10.

McClure, J., Sutton, R M., & Sibley, C. G. (2007). Listening to reporters or engineers: How different messages about building design affect earthquake fatalism. *Journal of Applied Social Psychology, 37,* 1956-1973.

McClure, J., White, J., & Sibley, C. G. (2009). Framing effects on preparation intentions: Distinguishing actions and outcomes. *Disaster Prevention and Management, 18,* 187-199.

Mileti, D. S., & Darlington, J. D. (1995). Societal response to revised earthquake probabilities in the San Francisco Bay area. *International Journal of Mass Emergencies and Disasters, 13,* 119-145.

Mileti, D. S., & O'Brien, P. W. (1992). Warnings during disaster: Normalizing communicated risk. Social Problems, 39, 40-57.

Nakashima, M., Chusilp, P. 2003. A partial view of Japanese post-Kobe seismic design and construction practices. *Earthquake Engineering and Engineering Seismology. 3*, 3–13.

Reve, (2011). Nuclear's Health Risks on Chernobyl Anniversary. http://www.evwind.es/noticias.php?id_not=11411.

Ronan, K. R., Johnston D.M., Paton, D. (2001) Communities' understanding of earthquake risk in the Hawke's Bay and Manawatu-Wanganui regions, *New Zealand. New Zealand Society for Earthquake Engineering Conference , Paper No. 1.03.01*.

Sattler, D. N., Kaiser, C. F., & Hittner, J. B. (2000). Disaster preparedness: Relationships among prior experience, personal characteristics, and distress. *Journal of Applied Social Psychology, 30,* 1396-1420.

Slovic, P. Fischhoff, B., & Lichtenstein, S. (1982). Facts versus fears: Understanding perceived risk. In D. Kahneman, P. Slovic, & A. Tversky (Eds.) *Judgment under uncertainty: Heuristic and biases.* Cambridge: Cambridge University Press.

Spiegel online, (2011). Nuclear Phase-out Could Spell Disaster for German Energy Giants. http://www.spiegel.de/international/business/0,1518,766095,00.html.

Spittal, M. J., McClure, J., Siegert, R. J., & Walkey F. H. (2005). Optimistic bias in relation to preparedness for earthquakes. *Australasian Journal of Disaster and Trauma Studies, 2005-1,* 1-10.

Spittal, M., McClure, J., Walkey, F., & Siegert, R. (2008). Psychological predictors of earthquake preparation. Environment and Behavior, 40, 798-817.

Spittal, M. J., Siegert, R. J., McClure, J., & Walkey, F. H. (2002). The Spheres of Control scale: The identification of a clear replicable factor structure. *Personality and Individual Differences, 32,* 121-131.

Stone, E. R., Yates, J. F., & Parker, A. M. (1994). Risk communication: Absolute versus relative expressions of low-probability risks. *Organizational Behavior and Human Decision Processes, 60,* 387-403.

Weinstein, N. D. (1980). Unrealistic optimism about future life events. *Journal of Personality and Social Psychology, 39,* 806-820.

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Questionnaire: the Canterbury Earthquake: Christchurch participants

1. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

2. Since the earthquakes, how likely do you rate a future big earthquake near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

3. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Wellington?

Not at all (likely) 1 2 3 4 5 very (likely)

4. Since the earthquakes, how likely do you rate a future big earthquake near Wellington?

Not at all (likely) 1 2 3 4 5 very (likely)

5. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

6. What do you currently think is the likelihood of a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

7. Did you expect an event such as the Canterbury earthquakes to happen in your lifetime? Yes / No

8. Has the risk of an earthquake become more real or plausible to you since the Canterbury earthquakes?
Yes / No

9. If you previously thought an earthquake near Christchurch was unlikely, why was that?
[Tick all that apply]

a) It was not going to happen
b) I thought Christchurch was not earthquake prone as there was no fault line there
c) I thought it would happen elsewhere; that e.g., Wellington was a bigger risk
d) There had been no damaging earthquake in recent NZ history
e) I have had no personal experience of an earthquake
f) Other – (describe):_____

10a. **Before the earthquakes,** were you aware of any information about how to prepare for a possible earthquake? Yes/not sure/no [circle one]
10b. Where did you see this information? [Circle one]: TV/ print/Other_____

11. If you were aware of this information, did you regard it as relevant for you? Yes/ Some relevance/No

12. Before the earthquakes, had you made any preparations specifically for an earthquake? Yes /no

13. If you said **YES** to the previous question, please list these preparations: [tick those that apply]

a) Got basic needs e.g. canned food, water, emergency kit
b) Got basic equipment, e.g., torch, batteries
c) Got communications e.g., battery radio
d) Logistics /planning e.g., planned where to meet
e) Damage mitigation; quake-safe the house, or check it is quake safe
f) Other (describe):_____

14. If you **did** make any preparations for an earthquake, what is the main reason? [Tick those that apply]
    a) My personality e.g. I'm a sensible person
    b) Just in case of an emergency
    c) I thought an earthquake might happen;
    d) Past experience of an earthquake
    e) Advice from the media; education
    f) Other – (describe):_____

15. If you did **not** prepare before the Canterbury earthquakes, what is the main reason you didn't?
    a) My personality e.g. I'm complacent, lazy, or unorganised and didn't get around to it
    b) I didn't think about it
    c) I thought an earthquake wouldn't happen; that it was not a serious risk
    d) I had no past experience of an earthquake
    e) I did not take advice from the media seriously
    f) Other – (describe):_____

16. **Since the earthquakes**, have you made any preparations specifically for an earthquake? Yes /no

17. If you said **YES** to the previous question, please list these preparations: [tick those that apply]
    a) Got basic needs e.g. canned food, water, emergency kit
    b) Got basic equipment, e.g., torch, batteries
    c) Got communications e.g., battery radio
    d) Logistics /planning e.g., planned where to meet
    e) Damage mitigation; quake-safe the house, or check it is quake safe
    f) Other – (describe):_____

18. In the next month or so, do you intend to: [Yes/ Possibly / no]
    a) Check your level of preparedness for earthquakes? ____ ____ ____
    b) Increase your level of preparedness for earthquakes? ____ ____ ____
    c) Become involved with a local group to discuss how to reduce earthquake damage or losses? ____ ____ ____
    d) Seek information on earthquake risk? ____ ____ ____
    e) Seek information on things to do to prepare? ____ ____ ____
    f) Get your house checked for its earthquake safety? ____ ____ ____

19. Did you incur a lot of damage in the earthquakes?
    No damage 1 2 3 4 5 Extensive damage

20. If there is one thing you wished you'd done before the earthquake, what is it? (Circle one)
    a) I hadn't got basic needs e.g. canned food, water, emergency kit
    b) I hadn't got basic equipment, e.g., torch, batteries
    c) I hadn't got communications e.g., battery radio
    d) I hadn't done logistics /planning e.g., planned where to meet
    e) I hadn't done any damage mitigation e.g., quake-safe the house, or check it is quake safe
    f) Other (describe):_____

21. Any other comments you would like to make [about earthquakes or the Canterbury earthquakes]
_____

_____

Demographics (optional): Male/Female Age: under 20 21-30 31-40 41-50 over 50
No. of dependent children in your household_____; Suburb _____

THANK YOU VERY MUCH – WE REALLY APPRECIATE YOUR TIME

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Questionnaire: the Canterbury Earthquake: Wellington participants

1. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

2. Since the earthquakes, how likely do you rate a future big earthquake near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

3. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Wellington?

Not at all (likely) 1 2 3 4 5 very (likely)

4. Since the earthquakes, how likely do you rate a future big earthquake near Wellington?

Not at all (likely) 1 2 3 4 5 very (likely)

5. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

6. What do you currently think is the likelihood of a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

7. Did you expect an event such as the Canterbury earthquakes to happen in your lifetime? Yes / No

8. Has the risk of an earthquake become more real or plausible to you since the Canterbury earthquakes? Yes / No

9. If you previously thought an earthquake near Christchurch was unlikely, why was that? [Tick all that apply]

a) It was not going to happen
b) I thought Christchurch was not earthquake prone as there was no fault line there
c) I thought it would happen elsewhere; that e.g., Wellington was a bigger risk
d) There had been no damaging earthquake in recent NZ history
e) I have had no personal experience of an earthquake
f) Other – (describe):_____

10a. **Before the earthquakes,** were you aware of any information about how to prepare for a possible earthquake? Yes/not sure/no [circle one]
10b. where did you see this information? [Circle one]: TV/ print/ Other_____

11. If you were aware of this information, did you regard it as relevant for you? Yes/ Some relevance/No

12. Before the earthquakes, had you made any preparations specifically for an earthquake? Yes /no

13. If you said **YES** to the previous question, please list these preparations: [tick those that apply]

a) Got basic needs e.g. canned food, water, emergency kit
b) Got basic equipment, e.g., torch, batteries
c) Got communications e.g., battery radio
d) Logistics /planning e.g., planned where to meet
e) Damage mitigation; quake-safe the house, or check it is quake safe
f) Other (describe):_____

14. If you **did** make any preparations for an earthquake, what is the main reason? [Tick those that apply]
    a) My personality e.g. I'm a sensible person
    b) Just in case of an emergency
    c) I thought an earthquake might happen;
    d) Past experience of an earthquake
    e) Advice from the media; education
    f) Other – (describe):_____

15. If you did **not** prepare before the Canterbury earthquakes, what is the main reason you didn't?
    a) My personality e.g. I'm complacent, lazy, or unorganised and didn't get around to it
    b) I didn't think about it
    c) I thought an earthquake wouldn't happen; that it was not a serious risk
    d) I had no past experience of an earthquake
    e) I did not take advice from the media seriously
    f) Other – (describe):_____

16. **Since the earthquakes**, have you made any preparations specifically for an earthquake? Yes /no

17. If you said **YES** to the previous question, please list these preparations: [tick those that apply]
    a) Got basic needs e.g. canned food, water, emergency kit
    b) Got basic equipment, e.g., torch, batteries
    c) Got communications e.g., battery radio
    d) Logistics /planning e.g., planned where to meet
    e) Damage mitigation; quake-safe the house, or check it is quake safe
    f) Other – (describe):_____

18. In the next month or so, do you intend to: [Yes/ Possibly / no]

a) Check your level of preparedness for earthquakes?	____	____	____
b) Increase your level of preparedness for earthquakes?	____	____	____
c) Become involved with a local group to discuss how to reduce earthquake damage or losses?	____	____	____
d) Seek information on earthquake risk?	____	____	____
e) Seek information on things to do to prepare?	____	____	____
f) Get your house checked for its earthquake safety?	____	____	____

19. Did you know anyone close to you who lives in Christchurch? Yes/no

20. Did you know anyone who incurred a lot of damage in the earthquakes? Yes/no

21. Any other comments you would like to make [about earthquakes or the Canterbury earthquakes]

_____

_____

Demographics (optional): Male/Female Age: under 20 21-30 31-40 41-50 over 50

No. of dependent children in your household_____; Suburb _____

THANK YOU VERY MUCH – WE REALLY APPRECIATE YOUR TIME

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Questionnaire: the Canterbury Earthquake: Palmerston North participants

1. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

2. Since the earthquakes, how likely do you rate a future big earthquake near Christchurch?

Not at all (likely) 1 2 3 4 5 very (likely)

3. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a big earthquake in or near Palmerston North?

Not at all (likely) 1 2 3 4 5 very (likely)

4. Since the earthquakes, how likely do you rate a future big earthquake near Palmerston North?

Not at all (likely) 1 2 3 4 5 very (likely)

5. Before the 2010-2011 Canterbury earthquakes, how likely did you think it was there would be a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

6. What do you currently think is the likelihood of a serious earthquake in another part of New Zealand?

Not at all (likely) 1 2 3 4 5 very (likely)

7. Did you expect an event such as the Canterbury earthquakes to happen in your lifetime? Yes / No

8. Has the risk of an earthquake become more real or plausible to you since the Canterbury earthquakes?
Yes / No

9. If you previously thought an earthquake near Christchurch was unlikely, why was that?
[Tick all that apply]

a) It was not going to happen
b) I thought Christchurch was not earthquake prone as there was no fault line there
c) I thought it would happen elsewhere; that e.g., Wellington was a bigger risk
d) There had been no damaging earthquake in recent NZ history
e) I have had no personal experience of an earthquake
f) Other – (describe):_____

10a. **Before the earthquakes,** were you aware of any information about how to prepare for a possible earthquake?
Yes/not sure/no [circle one]
10b. Where did you see this information? [Circle one]: TV/ print/ Other_____

11. If you were aware of this information, did you regard it as relevant for you? Yes/ Some relevance/No

12. Before the earthquakes, had you made any preparations specifically for an earthquake? Yes /no

13. If you said **YES** to the previous question, please list these preparations: [tick those that apply]

a) Got basic needs e.g. canned food, water, emergency kit
b) Got basic equipment, e.g., torch, batteries
c) Got communications e.g., battery radio
d) Logistics /planning e.g., planned where to meet
e) Damage mitigation; quake-safe the house, or check it is quake safe
f) Other (describe):_____

14. If you **did** make any preparations for an earthquake, what is the main reason? [Tick those that apply]
    a) My personality e.g. I'm a sensible person
    b) Just in case of an emergency
    c) I thought an earthquake might happen;
    d) Past experience of an earthquake
    e) Advice from the media; education
    f) Other – (describe):_____

15. If you did **not** prepare before the Canterbury earthquakes, what is the main reason you didn't?
    a) My personality e.g. I'm complacent, lazy, or unorganised and didn't get around to it
    b) I didn't think about it
    c) I thought an earthquake wouldn't happen; that it was not a serious risk
    d) I had no past experience of an earthquake
    e) I did not take advice from the media seriously
    f) Other – (describe):_____

16. **Since the earthquakes**, have you made any preparations specifically for an earthquake? Yes /no

17. If you said **YES** to the previous question, please list these preparations: [tick those that apply]
    a) Got basic needs e.g. canned food, water, emergency kit
    b) Got basic equipment, e.g., torch, batteries
    c) Got communications e.g., battery radio
    d) Logistics /planning e.g., planned where to meet
    e) Damage mitigation; quake-safe the house, or check it is quake safe
    f) Other – (describe):_____

18. In the next month or so, do you intend to: [Yes/ Possibly / no]

a) Check your level of preparedness for earthquakes?	____	____	____
b) Increase your level of preparedness for earthquakes?	____	____	____
c) Become involved with a local group to discuss how to reduce earthquake damage or losses?	____	____	____
d) Seek information on earthquake risk?	____	____	____
e) Seek information on things to do to prepare?	____	____	____
f) Get your house checked for its earthquake safety?	____	____	____

19. Did you know anyone close to you who lives in Christchurch? Yes/no

20. Did you know anyone who incurred a lot of damage in the earthquakes? Yes/no

21. Any other comments you would like to make [about earthquakes or the Canterbury earthquakes]

_____

_____

Demographics (optional): Male/Female Age: under 20 21-30 31-40 41-50 over 50
No. of dependent children in your household_____; Suburb _____

THANK YOU VERY MUCH – WE REALLY APPRECIATE YOUR TIME

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Appendix A Information Sheet:

Dr John McClure
Professor
Email: *john.mcclure@vuw.ac.nz*

What is the purpose of this research?

This research will allow us to understand why many people choose not to undertake different types of preparedness for earthquakes.

Who is conducting the research?

- I am a researcher in the School of Psychology at Victoria University of Wellington. This research is funded by Victoria University and GNS Science and has been approved by the University ethics committee.

What is involved if you agree to participate?

- If you agree to participate in this study you will complete a short questionnaire where you indicate your views about earthquakes whether you have taken different earthquake and reasons for why you have done so or not done so. (e.g. because it's not a top priority)". We anticipate that the survey will take you no more than 5-10 minutes to complete.
- During the research, you are free to withdraw at any point before your survey has been completed.

Privacy and Confidentiality

- This survey is completely anonymous. Please do not put your name on it anywhere. Completing the survey indicates your consent to participate in the research
- We will keep your survey for at least five years after publication.
- In accordance with the requirements of some scientific journals and organizations, the data from your coded survey may be shared with other competent researchers.
- A copy of the coded data will remain in the custody of Dr John McClure.

What happens to the information that you provide?

- The data you provide may be used for one or more of the following purposes:
  - The overall findings will be reported to the Earthquake Commission and later they may be submitted for publication in a scientific journal, or presented at scientific conferences.
  - We will post a summary of the results to you as soon as they are available.

Thank you for considering participation in this research.
John McClure

TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

Information Sheet

Dear Participant

Thank you for participating in this study, which is looking at people's perception of the risk of earthquakes since the Christchurch earthquake, and their explanations for why they have or have not undertaken different types of preparedness for earthquakes

Specifically, in this research we asked questions about your perceptions of the risk of earthquakes in Canterbury and elsewhere in New Zealand before and after the Canterbury earthquakes. We asked you if you had performed preparedness actions and to give your reasons for not performing these actions, where this was the case.

This research is important to clarify people's perception of the risk from earthquakes and their explanations for why they haven't performed actions that are important for their safety and survival during and after an earthquake.

The results from this research and related studies can be used by civic agencies to understand people's motives for preparing or not preparing for earthquakes and help them get more prepared.

Thank you again for participating in this research.

John McClure
Professor of Psychology

Email: john.mcclure@vuw.ac.nz

THANK YOU VERY MUCH – WE REALLY APPRECIATE YOUR TIME

Information for Riccarton Market, Christchurch

The Christchurch earthquake questionnaire invites citizens' perceptions about the risk from earthquakes in Christchurch. This research is being funded by the EQC (Earthquake Commission) because they want to know whether citizens' perceptions of earthquake risk have changed since the Canterbury earthquakes and whether those risk perceptions relate to people preparing for earthquakes. The questionnaire is being run in Christchurch, Wellington, and Palmerston North. The questionnaire was previously run at the Riccarton Market in November 2010, after the first major earthquake in September 2010. The Questionnaire asks people to give their estimate of the risk of an earthquake in Christchurch and elsewhere in NZ before and after the earthquakes and to note any actions they have taken to prepare before and after the earthquake.

The Questionnaire is designed by Professor John McClure of Victoria a University of Wellington and Dr David Johnston of GNS Science, both of whom are recognised researchers on earthquake preparedness and who are doing research for the Earthquake Commission to assist New Zealanders to in relation to earthquakes. The Questionnaire has been approved by the ethics committee of Victoria University of Wellington.

As on the previous occasion where we ran this Questionnaire, it is totally voluntary – people passing the stall are invited to fill in the 5 minute Questionnaire if they are interested. People who fill in the questionnaire are given a chocolate bar for their time. Those who fill in the Questionnaire can request a summary of the results if they are interested. On the previous occasion we found that Christchurch citizens much appreciated the opportunity to express their views and talk about the earthquakes. They also liked the chocolate!