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The perception of earthquake risk and the preparation for earthquakes in New Zealand: A research report prepared for the Earthquake Commission

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Abstract

This research examined the perception of risk of earthquake and preparedness for earthquake amongst the population of Wellington, and explored earthquake scientists' views of the accuracy of media reports of earthquake research. The research was conducted in three stages.

In the first stage a content analysis of Wellington newspapers and national magazines was carried out for a two-year period from May 1997 to May 1999 to identify articles covering earthquakes. The 38 scientists cited in those reports were sent a postal questionnaire covering questions relating to the accuracy of the media reports. Inaccuracies were identified in 57% of the articles, but overall scientists were reasonably satisfied with the media coverage of their research. They were less satisfied with the coverage of earthquake-related research in general. The main concern related to the sensational and dramatic treatment of some research.

In the second stage of the research a telephone survey was carried out with 200 respondents in the Wellington region. Respondents were selected on the basis of a systematic random sample using the Wellington telephone directory as a sampling frame. Respondents were asked questions that related to how fatalistic they felt about the effects of earthquakes, how they responded to earthquakes, their knowledge of earthquakes and tsunami, their knowledge of preparations that could be made for earthquakes, their view of scientists and their view of the media. The results indicate that the public do not feel helpless about the impact of earthquakes, have reasonable knowledge about earthquakes and possible preparations for earthquakes, but are less likely to have made preparations. The public also over estimate the likelihood of earthquakes happening in Wellington compared to estimates by scientists. Half of the respondents did not believe that scientists tell the public all they know about earthquakes, and the public rated the media reporting of earthquake issues as only slightly accurate.

In the third stage of the research 4 focus groups were carried out with members of the public to explore issues that arose from the previous stages of the research. These focus groups provided a rich source of information about people's reactions to earthquakes. They uncovered a variety of responses to the issue of preparation, suggesting that people in Wellington have a blasé attitude to earthquakes and earthquake preparation. This attitude may relate to a resistance to risk messages, to the practical difficulties of taking more than basic precautions, and to a lack of urgency due to the unpredictability of earthquakes. One prominent concern for many participants related to having their family together in the event of an emergency such as an earthquake.

Recommendations from the research include providing people with preparation information that gives them some sense of control but is easy to carry out. However, different groups of people are likely to respond to messages in different, and sometimes opposing, ways. Scientists need to consider ways of having some control over the presentation of their research in the media, as the sensational treatment of research may be undermining the credibility of scientists.

Introduction

This research explored the connections between the public's knowledge of earthquake issues and level of preparedness for earthquakes. It looked at how perceptions and preparedness linked to a number of variables, and also how the public's perceptions differed from those given by experts studying earthquake phenomena. The way in which the public and experts viewed the media was also examined

In exploring the communications of risk in this manner the project emulated some aspects of Allan Bell's study of global warming (Bell, 1989; 1991). Bell's research identified mismatches between the public understanding of climate change, media representations of climate change and scientists' views on climate change. Amongst other things, Bell found that the media tended to exaggerate the claims made by scientists on climate change and that although the public in turn exaggerated media claims, the basic message about greenhouse effects and ozone depletion had come through.

Whereas Bell's focus was on media representations, this research focused more on the public understanding of the issues. The issue of climate change is to some extent open to dispute but the issue of earthquakes is much less controversial. Although scientists may dispute the causes of earthquakes and there may be variable ideas on the predictability of earthquakes, the existence and experience of earthquakes is undisputed. Such a study of a relatively non-controversial topic is of interest from a public understanding of science position.

Published studies have looked at the issue of preparedness for earthquakes and related this to a number of variables such as age (Simpson-Housley & Curtis, 1983), education (Man & Simpson-Housley, 1987), length of residence (Man & Simpson-Housley, 1988), psychological factors such as fatalism and unrealistic optimism (McClure & Williams, 1996), the influence of neighbours and others (Turner, Nigg & Paz, 1986), and home ownership and ethnicity (Howarth, 1998). A Wellington Regional Council report argued that "public and government perceptions of earthquake and geological hazards often underestimate the level of risk that such events pose " (Planning and Policy Department, Wellington Regional Council, 1995). A 1998 Wellington survey found that 11 per cent of the population stated that they had not prepared for disaster because they did not know how to prepare (Howarth, 1998). Turner, Nigg and Paz (1986) carried out a small test where they asked about the respondents' knowledge, for example, where would you stand in a building? Do aftershocks cause damage? They found high levels of knowledge about where to stand in buildings, but one-fifth believed that no damage would be caused by aftershocks. Even though this is a small number, the authors suggest that it could be significant in the event of an earthquake in terms of the actions that people take.

The Turner, Nigg and Paz study indicated a high level of mistrust of science and public officials when it came to some aspects of earthquake information. They found that nearly half of their respondents believed that public officials

or scientists were withholding information about earthquake threats. This is perhaps surprising given the argument that earthquakes are relatively uncontroversial. However, predictions about earthquakes and the sort of damage that they might do may provoke more anxiety and therefore heighten the mistrust of scientists.

Alongside this mistrust Turner, Nigg and Paz found that people were overconfident in current scientific capabilities. They found that 42 per cent of respondents believed that scientists could predict earthquakes somewhat or quite accurately. However, respondents also believed that a number of other sources could act as predictors of earthquakes, for example, 68 per cent believed animal behaviour could predict earthquakes, and 43 per cent believed that unusual weather might herald earthquakes. In addition, they found that those who believe "most indiscriminately in the predictability of earthquakes" were the most prepared. They argue that an unjustified belief in folk signs links to people's sense of personal understanding. It could be suggested here that such unjustified beliefs might give people a greater sense of control over events.

In their study in California Mileti and Fitzpatrick (1992) found that preparedness for earthquakes was more affected by people seeking information than any other variable. Information seeking was mostly influenced by the reinforcement of risk information (that is, multiple messages through multiple channels) and observing the social cues of others. Studies also suggest that a "disaster culture" develops in areas where the messages about disasters are reinforced (Mileti & Darlington, 1997).

The public understanding of science is closely related to the field of risk communication. Over the last two decades risk communication has been seen as way of overcoming public-expert discord over risks, often on the assumption that people have the right to know what hazards they face (Cvetkovich & Earle, 1992). This straightforward picture of risk communication as dissemination of information that is passively received is not always borne out. People make sense of information according to their own experiences and circumstances (Irwin & Wynne, 1996). Values, attitudes, social influences and cultural identity influence the perception of risk and the evaluation of unwanted consequences (Renn et al, 1992). Differences between expert predictions of risk and the public's perception of risk are due to complex factors (Gough, 1991). In addition, the public tend to be unfamiliar with uncertainty in risk assessment science (Johnson & Slovic, 1995). People look for information that is consistent and certain (Mileti & Fitzpatrick, 1992; Turner, Nigg & Paz, 1986). If information is relatively uncontentious then certainty can be conveyed. In the case of earthquakes, information about their effects is relatively uncontended, but not always acted upon in terms of preparation.

Renn and colleagues use the concept of the social amplification of risk in their studies of risk perception and related actions. They suggest that the experience of risk is the

Research Design

The first stage of the research involved identifying articles on earthquake issues in Wellington newspapers and selected national magazines. The following were covered:

The Dominion: May 1997 - May 1999.
Evening Post: May 1997 - May 1999.
The Listener: May 1997-May1999.
Metro: May 1997-May 1999.
North and South: May 1997-May 1999.
Next: May 1997-May 1999.

Articles were identified through a visual search of hard copy versions where available, and microfiche versions. Although most articles selected were specifically earthquake related, the category was kept a little broader than that so that earth tremors associated with volcanic activity, and tsunami, were not excluded.

Over that time period there were no articles in these magazines that cited scientists as sources. In the *Evening Post* there were a total of 165 articles and advertisements relating to earthquakes, and in *The Dominion* there were 347 articles.

From the articles collected a subset was identified where New Zealand 'scientists' had been cited as a source of information. For the purposes of the research the term scientist was kept broad, and although the largest proportion identified could be labelled seismologists, there was also an economist, a psychologist, and earthquake engineers.

A total of 73 articles were identified, which involved a total of 38 scientists. 33 articles were from the *Evening Post* and 40 from *The Dominion*.

All identified scientists were contacted by telephone, where possible, to ask if they would be willing to participate in research looking at the accuracy of media representations. All those contacted agreed to participate. After this they were all sent a questionnaire (see appendix 1), which was based on a questionnaire used by Allan Bell in his study of media reporting of climate change (Bell, 1989). Along with the questionnaire they were sent copies of the article or articles in which they were cited. Respondents were asked to fill out a separate questionnaire for each article. This stage of the research was mainly carried out during the months of August and September 1999.

The next stage of the research was a telephone survey (see appendix 2) of 200 randomly selected residents in the Wellington region. The survey sample was selected by a systematic random procedure using the Wellington telephone book as a sampling frame. The numbers were called, and if there were no answer there would be two more phone backs at different times of

the day or evening. If after this there was no answer or there was a rejection then the number above or below that number would be taken. There were many no-answers, but far fewer refusals, occurring at a rate of around 3.5 refusals to 2 acceptances. The questionnaire covered such issues as knowledge of preparedness for earthquakes, preparedness for earthquakes, knowledge about predictability of earthquakes, knowledge about damage from earthquakes, and sources of information about earthquakes. Included were some questions about the media and scientists. This stage of the research was carried out mainly in the months of January, February and March 2000.

The final stage of the research involved the use of focus groups. The participants for the focus groups were drawn from a pool of those that had answered the telephone survey and expressed a willingness to participate in a focus group. In order not to increase respondent burden potential participants were contacted from those who lived closer to Wellington itself, as opposed to the outer suburbs in the Hutt Valley or Porirua.

Four focus groups were arranged to take place at the Department of Sociology and Social Policy at Victoria University of Wellington. All but one of the participants made their own way to the venue, and the principal researcher picked up one. They were held between 12 and 18 April 2000, two during the day and two during the evening. Although between 6 and 8 respondents consented to attend each focus group the actual numbers that turned up on the day were respectively, 6 (all women), 4 (two men and two women), 5 (two men and three women) and 5 (one man and four women).

Participants signed a consent form and were offered tea/coffee and biscuits. The areas discussed in the focus groups are included in appendix 3, and were derived from issues that came out of the survey. The principal researcher facilitated the discussions which were all audiotape recorded (with notes taken as well), and then fully transcribed. The focus group transcriptions were analysed by a method of systematic coding to identify the variety of themes discussed.

Analysis of Survey of Scientists

Of the 38 scientists sent questionnaires, 29 returned them. One did not fill the questionnaire in as he thought the article was not relevant to the questionnaire. This was recorded as a non-response, leaving a total of 28 returns at a response rate of 73.7 %. The total number of articles responded to was 56, giving coverage of 76.7%.
The following sections summarise the responses to the questionnaires.

Accuracy of articles

All inaccuracies identified under questions 3 to 9 were counted. There were a total of 101 inaccuracies noted by the scientists. Of the 56 articles responded to, there were 6 where more than one scientist was mentioned. On two of these occasions the same inaccuracy was noted, leaving a total of 99 inaccuracies. There was an average of 1.8 errors per article, which compares with 2.7 inaccuracies per 'story' in Bell's study.

Respondents were asked to assess the accuracy of the articles in which they were cited on a five-point scale, where 1 was absolutely accurate and 5 was extremely inaccurate. The aggregated response to this was 2.09 (compared to 1.98 in Bell's study of Climate Change)[1]. *The Dominion* was rated as 2.11 and the *Evening Post* as 2.07. From this it can be suggested that scientists saw these articles as being reasonably accurate. Respondents were asked to identify where any inaccuracies occurred in an article.

For 43% of the articles scientists claimed that there were no inaccuracies (this compares to 20% in Bell's study). In 31 of the 56 articles, or in the remaining 57%, there were inaccuracies in at least one of the sections, and in some articles there were inaccuracies in more than one section. Of particular note is that in 7 of the 56 articles (12%) there was an inaccuracy either in the headline and/or in the first paragraph. These parts of an article are the most likely to be read. Table 1 shows the ratings of inaccuracies.

Table 1: Scientists' ratings of the accuracy of articles

Rating	Responses	% of total responses
1 = Absolutely accurate	12*	21%
2	32**	57%
3	8	14%
4	4	7%
5 = Extremely inaccurate	0	0%
Total	**56**	**99%***

* One respondent circled 1.5, which has been placed in the 1 category.
** One respondent circled 2.5, which has been placed in the 2 category
*** Due to rounding procedures the total percentage does not add to 100.

[1] It should be noted that aggregating a Likert scale in this fashion might not be appropriate. There is an underlying assumption that if a respondent circled "2", then they were assessing the article as twice as inaccurate as a "1" rating. This is not necessarily the case. However, Bell did use this in his study, so the earthquake figures can at least be compared with the climate change ones.

From Table 1 it can be seen that 21% rated the articles as absolutely accurate, and although this means that 79% believed there was misreporting, for 57 % of respondents this was only slightly inaccurate, and only 7% as very inaccurate. None saw the articles as extremely inaccurate. This does still leave 21% claiming that inaccuracies are in the moderate to serious category (3 and 4 combined).

Headlines

Inaccuracies in headlines included over- or understatements and inappropriate words. Examples of inappropriate words included the following:
Headline reads "SI Quake Overdue - Scientists" but "Overdue" is inaccurate.
Headline reads "Landslide Linked to Killer Wave", whereas the scientist stated that "We positively linked the wave to earthquake rupture and not a landslide".

Overstatements/Understatements included the following:
Headline reads "Geysers React to Quake Swarm". The scientist argued that only one geyser was suspected of having changed.
Headline states "Shake-up for city buildings". The scientist thought this was too dramatic, and really meant "earthquake safety of old buildings to be checked".
Headline reads "Capital's loss from 'Big Quake' put at $10b". The cited scientist stated that the "figure is the loss in capital stock only. Takes no account of losses in income/economic activity i.e. it's only one part (albeit the major part) of losses in an earthquake."

Bell (1989) notes that headlines are written by sub-editors in New Zealand, and not the journalist. It should also be noted that the figure of 11% inaccuracies in headlines is similar to Bell's study of climate change (one in nine), but is still relatively small. That is, 89% of Headlines are deemed accurate.

In the first paragraph there were also overstatements and understatements. In one article it was stated that "hundreds of thousands" of injuries would occur in a big earthquake in Wellington, whereas it should be just "thousands". Another articles states "Emergency management is getting a shake-up as a swarm of earthquakes is predicted to rock the region". The scientist stated that the swarm of earthquakes was not predicted, but was actually occurring.

Scientific inaccuracies

In 28 articles (50%) scientists claimed that there were inaccurate scientific or technical facts. This is by far the greatest source of inaccuracy. The main inaccuracies related to oversimplification and the provision of incorrect "quantities", and other inaccuracies were due to mixing terms, exaggerations, or simply being incorrect.

Simplifying/incorrect quantities

These included simple errors such as giving the magnitude of the "next big quake" as being possible seven, whereas the magnitude should have been eight. More complex errors related to probability issues. One article stated that the scientists "said the Wellington Fault... was overdue to move". The cited scientist stated that "the fault is not overdue for movement", and that this was a repetition of a popular myth. The correct statement would be to say that there was a "10% probability of movement in the next 50 years". In another article about the economic impact of a major earthquake in Wellington the scientist stated that the "Numbers quoted are for a specific extreme scenario (not the scenario that is the main focus of the report). Also they are wrong".

In another article a quake is described as a "Second large jolt". The scientist stated that "Officially a magnitude 5.2 earthquake is described as 'moderate'". He went on to say that the concern is that if small earthquakes are described as "large" then an incorrect impression of earthquake threat is generated (e.g. "we survived a large earthquake OK"). The same article went on to state that there had been "allegations [that] the Capital is completely unprepared to deal with a major emergency". The scientist stated that there was only one allegation.

In another article the scientist stated that "The reporter misunderstood the "spirit level" effect of land tilting on a lake. The lake level does not change - the level appears to fall at the end which is rising land (bulging), and appears to rise at the other end where the land is tilting down". The article reads "The second activity, land deformation, is constantly being measured by a network of lake recording devices, based on the simple science that land bulging at one side of the lake would cause water levels to drop at the other"

Four scientists stated that the issue they were cited in relation to was being over-simplified, although in one case it was planned to be a simplified.

Incorrect

Another article allegedly quoted the words from an Emergency Management Officer worker, stating that "Wellington is leading the way, possibly in the world, in getting itself ready for an earthquake". The scientist also cited in the article said that the quoted words may be accurate, but they are wrong. Using the same Emergency Management Officer as a source, the article stated that "Wellington had a bad reputation for earthquakes but was really no more risky than areas like Auckland or Christchurch". The scientist stated that "Wellington does have a greater hazard from earthquakes than either Auckland or Christchurch."

An article stated that there had been a record of increases in volcanic activity in the central North Island. The scientist stated that there was no increase in volcanic activity.

Exaggeration

One article stated that "Geologists say the quake will cause hundreds of landslides in Westland, devastating towns and cutting roads, power and water", the geologist concerned did not recall using the word "devastating".

Non-technical facts

In 14 articles (25%) scientists claimed that there were inaccurate non-scientific or non-technical facts. One case was where a claim was attributed to the scientist when it was not his work. In another case the scientist had provided rough estimates about dates and costs, but these were "presented as fact". There were five instances of names or titles being incorrectly spelt or reported. Other inaccuracies included incorrect or overstated claims.

Accurate reporting of words

Table 2 shows the responses to a question that asked about how accurately their words had been represented in the article.

Table 2: Accuracy of the use of scientists words in newspaper articles.

Accuracy of quotes	Responses	% of total articles
Quoted accurately	32	55%
Distorted by being paraphrased	13*	22%*
Distorted by being abbreviated	7	12%
No response	3	5%
Quoted out of context	2	3%
Misquoted	1	2%
Total	**58**	**99%****

* Two respondents provided more than one response, and both extra responses were in this category.
** Due to rounding procedures the percentage figure does not equal 100.

Out of a total of 56 articles, 32 (55%) were claimed to have been quoted accurately. It should be noted that in some articles these would not have been direct quotes. However, this still leaves 43% of articles with some inaccuracy in the reporting of words used, and most of this led to some distortion.

A number of the examples of inaccuracies have already been noted, including misquotes. Other inaccuracies occurred due to abbreviations and being out of context.
For example, in one article it states that "nothing we build can withstand the force of even a 2-5m high tsunami". It needed to say can "completely" withstand. In another article the scientist claimed to be quoted out of context and distorted by being paraphrased. He stated that the "Main problem is figures quoted are for an extreme scenario even though most of my report/presentation focussed on the 'central scenario'".

Omissions

In response to the question, "has anything important been omitted?", for 9 out of the 56 articles (16%) the response was yes. These omissions included such things as not acknowledging the work of others, not mentioning that insurance claims made were minor, and leaving our caveats on margins of error and uncertainties of estimates. The omissions of concern are mainly over practical information, and creating a sense of certainty when such a strong sense cannot be justified.

Exaggerations

In response to the question, "Is anything in the article overstated or exaggerated?", for 18 out of the 56 articles (32%) the response was yes.

Many of these have already been mentioned in the above examples. Others comments included:

"General sensational treatment, but I think we need to accept that no one reads newspapers as scientific reports", and that to change there should be "less sensitivity by scientists and engineers".

In relation to another article, the scientist stated that " 'Prediction' of big earthquakes is a bit strong, since technically prediction means a fairly precise forecast of location and timing. However colloquially 'prediction' is OK". Another article refers to "four big tsunami", whereas the scientist claimed that the word "big" should be omitted.

Another article states "We're not talking next week. We're talking a longer timeframe, but with catastrophic results". The scientists claims that the use of "catastrophic" sensationalises.

In another article it stated that "Reports last week suggested this indicated the volcano beneath Lake Taupo could be close to erupting", whereas the scientist was "sure that reports from here did not suggest the volcano was close to erupting".

Another article stated that building owners are being advised to bring their premises "up to earthquake standards or be shut down, Wellington City Council says." Whereas the scientist reported said the Council had only said that they have the power to barricade to prevent entry. They haven't said they will barricade. They will however give notice for upgrading within a specified time.

In another article it stated that the cited scientist and others work to make sure that "buildings and roads are safe". The scientist claimed that this "is an exaggeration. Rather, our work is aimed at reducing the risk of damage to buildings and roads".

In terms of exaggeration there was, however, some possible disputes between scientists. One article quoted from two scientists. Scientist A claimed that on two counts the claims of scientist B had been exaggerated. The claims made by scientist B that scientist A took exception to were that "there was not enough money available for tsunami research" and that "A huge wave generated off the coast could devastate coastal cities such as Napier and Tauranga". Scientist A simply stated that "No it couldn't", and that there was a "Need to re-educate the scientist who overstated this case". Scientist B, who also responded to the survey, did not claim that his words had been misquoted. Thus we have conflict within the scientific community itself about claims and distortions.

Balance

A question asked whether there was anything distorted in the overall balance of the article. For 14 out of the 56 articles (25%) the response was yes. Many of these have already been mentioned in the above examples. Other comments included an article stating that the scientist "said most slips needed a trigger like water or a strong earthquake. Not much could be done to prevent a slip under those circumstances, whether the excavation work was done to modern or early standards" The scientist stated that "quite a lot of engineering can be done to prevent slope failures. Their determinant is cost".

In another article it stated that "However, it would be premature for scientists to recommend any widescale depopulation of the South Island, similar to that being done in Naples, Italy, which is threatened by the volcano Mt Vesuvius". The scientist stated that "mention of evacuation not warranted based on press release and interview".

One scientist commented that the article had a "Heavy emphasis on deaths rather than damage, whereas main focus was on damage and measures to minimise damage". The Headline of this article read "Big Quake Forecast to Kill up to 500".

Another scientist commented that there were distortions in the "Whole of [the] article: The article focuses almost wholly on cognitions that hamper preparation whereas the report focused not only on these but on ways of overcoming these".

Another scientist commented that "The article has been unduly sensationalised". This scientist refers to the Headline and the first paragraph, although he had recorded these as containing no inaccuracies. The sensationalism related to the Headline ""Big Quake Still Coming - Scientists" and the first paragraph stating "Wellington could have a massive earthquake 'at any time' scientists say, despite calculations that it is enjoying a quiet patch".

From the above it can be argued that imbalances in the articles related to journalists sensationalising and portraying the gloomiest or worst-case scenarios

Reasons for inaccuracies

In response to the question "What do you think were the reasons any inaccuracies occurred?", 23% put them down to the journalists lack of scientific background or understanding. However, 21% of scientists perceived the issue as being too complex in the first place. It is also notable that 8 out of the 28 respondents at least partially blamed themselves for not explaining themselves well enough.

Other comments on accuracy

Scientists were then asked if they had any other comments on the published article and its accuracy. To this question there were 24 responses. A break down of the responses indicated that 5 were generally negative, 2 neutral, and 17 generally positive. Negative comments included the view that the article was not informative, that it was too heavily edited and that the journalist should have checked back with the scientist. Positive responses were for a variety of reasons, which in the main covered the views that the article was well written, appropriate for the topic, accurate, covered the main points, was what people probably expected, was well-balanced and was not over the top.

Initiating the article

In 55% of cases articles were initiated by the journalist and only 9% by the cited scientist. Press officers made up the second largest category with 27% initiating articles. In terms of accuracy it is not surprising that those scientists who initiated the articles rated them as more accurate. As Bell (1989:85) argues, sources would have checked the material before presenting it to journalists, and also if they initiated the article they may be less likely to give it a lower rating. However, in contrast to Bell's findings, articles initiated by press officers were given the highest rating for inaccuracy. Looking through those responses it appears that press releases were modified in ways that made them more exaggerated or distorted, and that headlines and captions gave an inaccurate picture of the issue. In other words, sub-editors may have played a part in modifying the way in which press releases were presented.

In response to a question on whether the article was based on a press release from the scientist's organisation, 42 out of the 55, or 76%, who replied to this question said no. Table 3 related the use of press releases to accuracy ratings. One unexpected finding is that there appears to be no difference in the accuracy rating whether an article was published as a press release almost verbatim or not as a press release at all. As one of the low accuracy ratings related to one response that indicated there were no inaccuracies, nothing can be made of this.

Table 3: Articles based on press releases and accuracy rating

Article based on press release	Responses (% in brackets)	Accuracy rating
No	42 (76)	2.00
Published almost verbatim	7 (13)	2.00
Published with significant editing	4 (7)	2.50
Published with material added	2 (3)	3.00
Total	**55 (100)**	**2.09**

What the article consisted of

A question was asked to find out what the source of information was for the article.

Table 4: Scientists' source of information for articles and accuracy rating

Source of information	Responses (% in brackets)	Accuracy rating
Scientist's own research	38 (27)	2.05
Work of Colleagues/subordinates	30 (22)	1.92
Consensus scientific knowledge	24 (17)	1.92
Individual professional viewpoint	19 (14)	2.11
Acquired directly from other parties	11 (8)	1.95
Scientist's organisation's viewpoint	9 (6)	2.78
Personal opinion	7 (5)	2.00
Published paper	1 (1)	2.00
Total	**139 (100)**	**2.09**

Table 4 shows that the major category for the source of information was the scientist's own research, at 27%, and the next being the work of colleagues, at 22%. Only 17% responded that the information was consensus information.

The findings on table 4 were then correlated with the mean accuracy rating for these stories. The work of others and "consensus" knowledge was assessed as most accurately reported, whereas the scientist's organisation's viewpoint was perceived as being the least accurately reported. The latter only consisted of 9 articles, but three of them were given a lowly rating of 4 for accuracy. Two of these were rather baffling cases where the same scientist had given a rating of 4 but offered no examples of inaccuracies, and in fact responded that there were no inaccuracies (this scientist had also given two other articles ratings of 2, also with no inaccuracies noted). For this reason no significance can be attached to this finding.

Contact with the journalist

A question was asked about what sort of contact, if any, the scientist had with the journalist. For 38% of the articles there were telephone interviews, and for 18% there was face-to-face contact. In only 17 of the 56 articles, or 30% of cases, was there either no telephone contact or face-to-face contact. There were only 4 instances where information was gained from a public address alone, and these provided an average accuracy rating of 1.75, which is better than the overall average. This is in contrast to Bell's (1989) finding in his study of climate change that articles based on public addresses alone were rated as the most inaccurate.

Respondents were asked how much time in total they spent in one-to-one contact with the journalist over the article. For 27 articles (48% of responses) the time spent was less than 20 minutes. For 12 articles (21% of responses) it was between 20 and 60 minutes, for 1 (2% of responses) it was more than 60 minutes, and for 16 (29% of responses) no time at all was spent with the journalist.

Table 5: Time spent in one-to-one contact and accuracy rating

Time spent	**Responses** (% in brackets)	**Accuracy rating**
No time	16 (29)	1.91
Less than 20 minutes	27 (48)	2.22
20-60 minutes	12 (21)	2.13
More than 60 minutes	1 (2)	1.00
Total	**56 (100)**	**2.09**

Again, a slightly surprising result shown in Table 5 is the high accuracy rating given when no time at all was spent with the journalist. Of the 16 in this category a small number were given a "1" rating for accuracy. Three articles were based on reports/articles supplied by the scientist, and in one of these cases the information was regarded as very simple. One article was based on a public address.

Journalist's understanding

Respondents were asked to assess how well they felt the journalist understood what the scientist said to them on a five-point scale. Only 3 respondents did not respond to this, even though for 16 articles no time had been spent with the journalist. It can be assumed that respondents took this question at its broadest sense to make an assessment of the journalists understanding of the material in general. The aggregated response to this was 2.0, indicating that scientists overall felt that journalists understood the material reasonably well. To give a further breakdown of these figures they are listed in Table 6. Not surprisingly, accuracy ratings were highest where the journalist was perceived as having a good understanding.

Table 6: Journalists' understanding of issues and accuracy rating

Rating	**Responses** (% in brackets)	**Accuracy rating**
1 = Understood well	13 (25)	1.38
2	30 (57)	2.25
3	7 (13)	2.57
4	3 (6)	2.33
5 = understood poorly	0 (0)	0
Total	**53 (101)***	**2.00**

* Due to rounding procedures total does not come to 100.

In response to the question on whether respondents had checked the completed article with the scientist before publication, for 49 articles (88%), the answer was no. For only 4 articles (7%) had journalists checked back, half the response of the Bell study. For one article no answer was provided, but there had been no contact with the journalist, and for two others the scientist did not remember. One scientist noted that the journalist had checked back and had "actually found an error in what I said in the interview". Of the 4 that had checked back, 2 were given an accuracy rating of 1, and 2 an accuracy rating of 2. Bell notes that there is unwillingness on the part of journalists to check back, due both to time constraints and to a reluctance to yield editorial control.

Expectations

In response to the question on whether respondents felt that the article met their expectations when they had provided the material, for 42 articles (84%) the answer was yes, and the accuracy rating was 2.02. For 8 (16%) responses, the answer was no, and the accuracy rating here was 2.69. For 6 articles there was no response. For 5 of those 6 articles there had been no contact with the journalist, and for the other one the scientist stated that he had "no expectations, after 15 years of talking to the media I no longer have any". Similarly, another respondent noted that his expectations had been met, but stated "I am a cynic" - implying that his expectations were low.

In cases where expectations had not been met respondents were asked to state why this was the case. Some of the responses here were similar to previous comments about accuracy. Negative comments from four respondents were due to the articles being too sensationalised. Other comments included the article being too short, not clear and not balanced. For one respondent there was only one inaccuracy, but it was central. The respondent stated that "The journalist only got one bit wrong - but it happened to be an important minor detail, - that made the headline the opposite to what we found". The Headline read "Landslide linked to killer wave", but the scientist claimed that the tsunami was linked to earthquake rupture and not to a landslide.

Feedback

Fellow professionals or scientists gave feedback to the cited scientists in relation to 20 of the 56 articles (36%). In only 2 cases was the feedback seen

as only negative, and these appear to be minor cases, whereas positive feedback appears to be offered on 11 occasions. In four cases respondents stated that the feedback expressed pleasure at getting coverage on an issue. Other positive feedback included that there had been expressions of interest in their research or topic, that it was seen as a good report, and that the article highlighted scientific issues. Neutral feedback statements were that it had been seen, and that there had been humour at the poor journalism. Some of the feedback was qualified, for example, support at getting the coverage but concern that the sensational treatment diminished the credibility of the research. The negative feedback commented on was "teasing" about an incorrect caption, and surprise at journalistic license.

Scientists' response

Scientists were asked how they felt about the publication of the article and to rate this on a five-point scale. The aggregated figure was 2.2, which again indicated that scientists were reasonably happy with the results of the article. Table 7 provides a breakdown of these responses. As expected, scientists were more likely to be pleased with the article the more accurately they rated the article.

Table 7: Scientists' feelings about the article and accuracy rating

Rating	**Responses** (% in brackets)	**Accuracy rating**
1 = very pleased	9 (16)	1.39
2	31 (55)*	2.13
3	14 (25)	2.39
4	2 (4)	2.5
5 = very displeased	0 (0)	
Total	**56 (100)**	**2.20**

* One respondent recorded 2.5, which has been made into a 2.

Respondents were asked to comment on why they rated their response to the article in this way. Comments from those that were "very pleased" included that the information was accurate, well reported, raised the profile of the research/issue, and showed the value and contribution of science and scientists

Comments from those that were "pleased" included that the article provided publicity for the issue/research (even if there were flaws), showed the value of the research, raised awareness of the issue, educated the public, that it was balanced, that it covered a complex topic well, that it was an accurate presentation of a press release/article, and that it was as good as can be expected

Comments from those who gave a neutral response were that the article at least gave some presentation of an issue. But this sort of comment was tempered by such responses as the scientist being "dissatisfied with the credibility", that "It is what I have come to expect from journalists", "I had low expectations" and "professionally they are bad". Other comments include the article providing routine information.

Comments from those who were displeased were that the media treatment was negative in terms of "conveying an important topic to the public" and that "No attempt to find out more - it was a space filler".

Scientists general assessment

As noted earlier, when respondents were asked to assess the accuracy of the articles in which they were cited on a five-point scale, the aggregated response to this was 2.09. However, when respondents were asked to provide an assessment of the accuracy of media coverage of earthquakes in general the response was 2.67. (based on the number of respondents who provided a response and not the number of articles). For only 9 out of the 56 articles was coverage in general rated better than their own story. For 30 it was rated worse, and for 16 it was rated the same. This indicates that respondents were more critical of the general media coverage of earthquake issues than with articles in which they were cited. Bell also found this with climate change issues, and Bell cites studies in the USA that have also found this. Possible suggestions for this are that scientists are actually more critical of the accuracy of other scientists and other sources that are cited in the media, or that they assess articles where they are cited more leniently.

General comments

Respondents were then asked to add any further comments on issues raised concerning the media or earthquakes. The following are the main themes that came through.

Coverage was superficial and/or limited: One response stated that "Surely the official identification of 6 sq. km of Wellington as a tsunami hazard zone should prompt some investigative journalism into what is being done about it". Another stated that the media focussed on issues of preparation but that "it would be useful for preparation to also target strengthening buildings etc." It was suggested that "The media will often emphasise the exciting or controversial aspects of a topic, to the extent that the final article has little to do with the original topic!".

Lack of coverage: One respondent stated that the "Main problem is not the accuracy of reporting, but the quantity", and that more publicity was needed to raise the profile of 'good' science. Another respondent noted that the media coverage came in intense bursts. One respondent expressed the view that minor inaccuracies can be tolerated as the more important benefit was raising public awareness.

Confusion/Simplification in coverage: Other respondents noted confusion, for example over "intensity and magnitude" and the different scales. One respondent stated that "even I have trouble with geological terms. If you simplify the terminology it then becomes inaccurate". This relates to the issue of confusion. One respondent noted that "This is the problem, long and accurate items, that no one will read or understand, or short and possibly

inaccurate reports, that may at least be heard". One respondent felt that the media should "play a more informative and educative role based on well established scientific facts, than what it is right now".

Improved coverage: Three respondents felt that the media coverage and understanding was improving. And one respondent stated that "in general they are pretty good in New Zealand".

Journalist's effect: One respondent said that very seldom did he "find an enthusiastic or inquisitive reporter!", and another stated that "The accuracy of articles is very dependent on the particular journalist. Many grasp the necessary concepts easily while others have difficulty with them". This latter comment came from the scientist most cited in the media coverage.

Getting coverage/Dealing with the media: One respondent noted the role that he played in obtaining the coverage. He stated that

"The article was very high profile because:
1. I supplied good information in advance of the presentation.
2. I made myself available for the media.
3. The photograph was striking.
4. It was a quiet day politically!"

For another article he stated that "This article arose following direct media contact prior to the presentation of a public presentation to which the media were invited. I supplied written information 48 hours prior to the presentation plus made myself available before and after the presentation. The coverage was wide and accurate because, I believe, I went out of my way to be helpful to the media".

Another stated that "I try to express technical and scientific matters simply and fully explained. The outcomes are generally accurate and complete."

Relations between variables

Chi Square tests were used to test the relationships between the variables of technical inaccuracies and non-technical inaccuracies on the one hand, and omissions, exaggerations, distortions of balance, the journalist checking back, and the meeting of expectations on the other. No significant relationships were found. There were two instances where journalists checked back but still technical inaccuracies occurred in the article. In one instance this was due to the article being deliberately "lightweight", and in the second case the article was edited after the journalist had submitted it. In the total of 4 cases where journalists checked back, there were no inaccuracies of a non-scientific nature.

There were 20 cases where there were scientific inaccuracies and yet expectations of the scientist were still met. This perhaps indicates the leeway that scientists give to journalists. There were only 8 cases where there were non-scientific inaccuracies but expectations were still met.

Summary

Responses indicate a reasonable satisfaction with media coverage of earthquake-related issues. It must be noted that the focus of the questionnaire was on inaccuracies, and so reading through the information may give a distorted sense of the inaccuracies of media reporting. In 43% of articles scientists claimed that there were no inaccuracies at all, although only in 21% of cases did scientists rate articles as absolutely accurate. A common concern is that of sensationalism, and this is in tension with the desire to have research publicised and raise public awareness about issues perceived by the scientists as being important. This sensationalism is also of concern as the exaggeration or overstatement of issues may occur in the headline or first paragraph of an article. Not surprisingly, given the technical nature of some of the information in the articles, for 50% of articles there were scientific and technical inaccuracies noted, but many of these appear to be of a minor nature. It is also not surprising that newspaper coverage may be perceived as inaccurate given that scientists themselves may on occasion be in dispute with each other, or dispute the claims of other 'experts' in the field. It is perhaps of concern, however, that journalists so rarely check back with scientist about articles. Given the constraints on journalism it is probably overly optimistic to think that this would change. Some scientists suggest that a more proactive stance taken by scientists in relation to the media may promote their research and gain coverage of important issues.

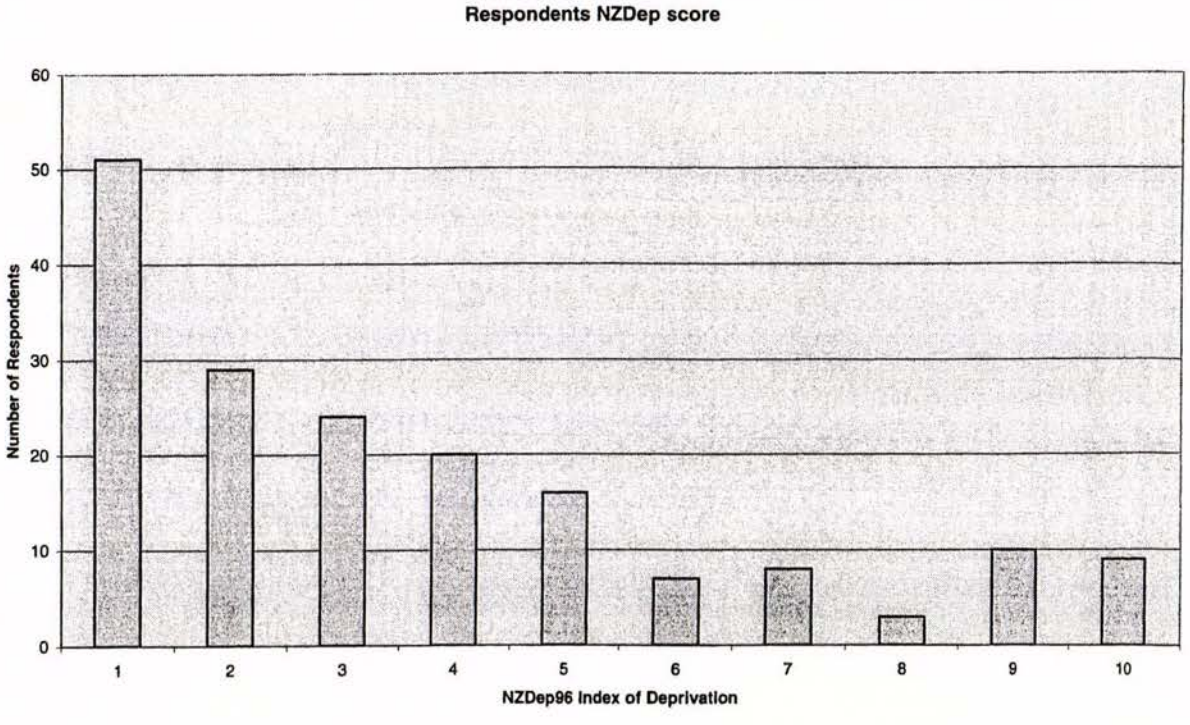
Analysis of Survey of the Public

Characteristics of the survey population

Of those surveyed, 120 were female and 80 male, 16% were in the 16-30 age group, 41% in the 30-50 age group and 42% 50 and over, 68% were married or living as married. Respondents were predominantly New Zealand European, at 78%, with 5% being Maori and 2% Pacific Nation. This roughly reflects the distribution in Wellington City. Respondents mostly owned their own homes (78%), and 40% had a tertiary qualification. Nearly 90% had been resident in Wellington for 5 years or more, with 62% being resident for more than 20 years, and 38% had experienced an earthquake where structural damage had occurred.

The following chart shows the NZDep96 scores for the respondents. This is an area-based measure of deprivation based on nine variables, including income, employment, qualifications, home ownership and access to a car. A score of 1 represents low levels of deprivation and a score of 10 represents high levels of deprivation. The chart shows that most respondents lived in areas with low deprivation scores. Wellington itself has low deprivation scores compared to many other parts of the country, and the profile here is not dissimilar to the actual profile of the NZDep96 index of deprivation for Wellington City.

Chart 1: Respondents NZDep96 Scores



Fatalism

A series of questions asked respondents whether they agreed or disagreed with a number of statements that gave a measurement of fatalism. The questions explored whether people thought there was anything that could be done about earthquakes.
In response, 78% agreed or strongly agreed with the statement that earthquakes would cause widespread loss of life and property whether preparations were made or not. However, 84% disagreed with the statement that preparations made for an earthquake were almost certain not to work, 90% disagreed with the statement that there is nothing people can do about earthquakes so there is no point in trying, and 89% disagreed with the statement that nothing is going to help if there were an earthquake. On close examination only 2 respondents could be described as consistently fatalistic or taking a position of helplessness. These were both women over 50 and had done little or nothing to prepare for an earthquake. When the first question was removed this still left only 6 respondents who were fatalistic for the other 3 questions. Five of these were women.

This finding in relation to fatalism indicates that Wellingtonians are generally not fatalistic, and believe that making preparations for earthquakes is not a waste of effort.

Responses to earthquakes

A question asked how respondents felt after they experienced a minor earthquake. This section looks at these responses and relates them to a number of other questions in the survey.

Table 8: Feelings after minor earthquake

Feelings	Responses	% of total responses
More worried – bigger one might come	87	43%
No Different	51	25.5%
Less worried – prevents a bigger one	33	16.5%
more worried – other reason	18	9%
less worried – other reason	4	2%
felt excited	4	2%
Non response	2	1%
No experience	1	0.5%
Total	**200**	**100%**

Table 8 shows that 16.5% stated that they were less worried after a minor earthquake as it might prevent a bigger earthquake, and 43.5% stated that they were more worried as it might herald a bigger earthquake. In none of the media reports was there a connection made to either of these scenarios, and according to seismologists there is no link. For the 16.5% who are less worried they may have a false sense of security.

Table 9: Feelings about minor earthquakes related to views on whether scientists tell all about earthquake prediction

Scientist tell us all (% in brackets)	**Response to minor earthquake**				
	More worried	Less worried	No different	Other	Total
Yes	52 (55)	15 (16)	17 (18)	11 (12)	95 (101)**
No	32 (32)	18 (18)	33 (33)	17 (17)	100 (100)
Total	**84 (43)**	**33 (17)**	**50 (26)**	**28 (14)**	**195***

*Five respondents did not respond or gave a don't know to the do scientists tell the public all they know question
** Due to rounding procedures this figure does not come to 100%.

Table 9 relates worry about earthquakes to respondents' opinion about whether scientists tell the public all they know about earthquake prediction. Those who were more worried after an earthquake were more likely to believe that scientists tell all, and those who felt no different were less likely to believe that scientists tell all (p. = 0.0101). This suggests that those who are more risk averse are more likely to trust the experts, whereas those who are more relaxed about earthquakes are less likely to trust earthquake scientists. This may mean that those who have no reaction to a minor earthquake are also more immune to messages coming from experts.

Table 10: Feelings about minor earthquakes related to gender

Gender (% in brackets)	**Response to minor earthquake**				
	More worried	Less worried	No different	Other	Total
Female	53 (44)	18 (15)	29 (24)	20 (17)	120 (100)
Male	34 (42)	15 (19)	22 (27)	9 (11)	80 (99)*
Total	**87 (43)**	**33 (16)**	**51 (25)**	**29 (14)**	**200 (98)***

* Due to rounding procedures this figure does not come to 100%.

Table 10 relates worry about earthquakes to gender. Although men were less worried than women after a minor earthquake there were no statistical difference between the genders (p. = 0.65).

Table 11: Feelings about minor earthquakes related to age

Age (% in brackets)	**Response to minor earthquake**				
	More worried	Less worried	No different	Other	Total
16-30	10 (31)	2 (6)	11 (34)	9 (28)	32 (99)**
30-50	34 (41)	19 (23)	17 (21)	12 (15)	82 (100)
50 or over	42 (49)	12 (14)	23 (27)	8 (9)	85 (99)**
Total	**86 (43)**	**33 (17)**	**51 (26)**	**29 (15)**	**199* (101)****

*One person did not provide an age, but also stated they were more worried
** Due to rounding procedures this figure does not come to 100%.

Table 11 relates worry about earthquakes to age. Those who feel no different after a minor earthquake are more likely to be in the 16-30 age group than in the 30-50 age group (p. = 0.04) and the older group (p. = 0.03). This suggests that the younger age groups are less responsive to earthquakes than other age groups.

Knowledge Questions

A number of questions in the survey explored the respondent's knowledge about earthquakes and related issues. This section looks at their responses and relates these to other variables. Table 12 shows the response to a question asking when do aftershocks occur.

Table 12: Opinions on when aftershocks occur

Timing	Responses	% of total responses
Within minutes	34	17%
Within hours	29	14.5%
Within days	79	39.5%
Within months	44	22%
Within years	8	4%
Don't know	6	3%
Total	**200**	**100%**

Only 26% thought they would occur within years or months, the rest having a much shorter time frame for aftershocks occurring.

Table 13: Opinion on when after shocks occur related to any preparation for earthquakes

Preparation (% in brackets)	Time within which after shocks occur					
	Minutes	Hours	Days	Months	Years	Total
No	15 (34)	7 (16)	16 (36)	4 (9)	2 (5)	44 (100)
Yes	19 (13)	22 (15)	63 (42)	40 (27)	6 (4)	150 (101)**
Total	**34 (18)**	**29 (15)**	**79 (41)**	**44 (23)**	**8 (4)**	**194* (101)****

*Six people did not provide an opinion on when aftershocks occur
** Due to rounding procedures this figure does not come to 100%.

Table 13 shows that there is a strong association between preparation and opinions on when aftershocks occur (p. = 0.007). Of those who had done nothing to prepare for an earthquake, only 14% gave this longer time frame for aftershocks occurring, with most of the unprepared giving a much shorter time frame of minutes or days. This provides some support for a view that those with incorrect views about aftershocks are more likely to do nothing.

Table 14: Opinion on when after shocks occur related to gender

Gender (% in brackets)	Time within which after shocks occur					
	Minutes	Hours	Days	Months	Years	Total
Female	23 (20)	16 (14)	44 (38)	29 (25)	4 (3)	116 (100)
Male	11 (14)	13 (17)	35 (45)	15 (19)	4 (5)	78 (100)
Total	**34 (18)**	**29 (15)**	**79 (41)**	**44 (23)**	**8 (4)**	**194* (101)****

*Six people did not provide an opinion
** Due to rounding procedures this figure does not come to 100%.

Table 14 shows the associations between opinions on when aftershocks occur and gender, and there are no statistically significant differences (p = 0.61).

Table 15: Opinion on when after shocks occur related to age

Age (% in brackets)	**Time within which aftershocks occur**					
	Minutes	Hours	Days	Months	Years	Total
16-30	9 (28)	3 (9)	13 (41)	6 (19)	1 (3)	32 (100)
30-50	15 (19)	15 (19)	31 (39)	15 (19)	4 (5)	80 (101)**
50 or over	10 (12)	11 (14)	35 (43)	22 (27)	3 (4)	81 (100)
Total	**34 (18)**	**29 (15)**	**79 (41)**	**43 (22)**	**8 (4)**	**193* (100)**

*Six people did not provide an opinion and one person did not provide an age.
** Due to rounding procedures this figure does not come to 100%.

Table 15 suggests that older people are more aware of when aftershocks can occur. Only 22% of 16-30 year olds gave within months or years as a time when aftershocks could occur, whereas 24% of 30-50 year olds and 31% of over 50s gave this opinion. There was however no statistically significant association between age and opinions on when aftershocks occur (p. = 0.55).

Table 16: Opinions on damage from aftershocks

Damage	**Responses**	**% of total responses**
Less than the original	79	39.5%
As much as the original	59	29.5%
More than original	55	27.5%
No damage	4	2%
Don't know	3	1.5%
Total	**200**	**100**

Table 16 shows the responses to the question asking what sort of damage aftershocks would cause. The table shows that 57% stated as much or more than the original earthquake and 41% less than the original or no damage. Given the possibility that major aftershocks can further de-stabilise buildings then 41% could be seen as having a wrong impression of the aftershock scenario. However, only 2% believed that aftershocks do not cause damage, and this compares very favourably with the one-fifth who believed so in the Californian study carried out by Turner, Nigg and Paz (1986).

Table 17 relates ideas on the damage caused by aftershocks to whether respondents had made any preparation and there is no statistically significant difference (p. = 0.29).

Table 17: Damage from aftershocks related to preparation made for earthquakes

Preparation (% in brackets)	**Damage from aftershocks**		
	More or as much as original	None or less than original	Total
No	23 (51)	22 (49)	45 (100)
Yes	91 (60)	61 (40)	152 (100)
Total	**114 (58)**	**83 (42)**	**197* (100)**

*Three respondents did not answer the question about when aftershocks occur. Two had not made any preparations.

Table 18: Damage from aftershocks related to gender

Gender (% in brackets)	**Damage from aftershocks**		
	More or as much as original	None or less than original	Total
Female	64 (54)	54 (46)	118 (100)
Male	50 (63)	29 (37)	79 (100)
Total	**114 (58)**	**83 (42)**	**197* (100)**

*Three respondents did not answer the question about when aftershocks occur. Two had not made any preparations. Two were female.

Table 18 relates views on damage from aftershocks to gender. There was no statistical difference between men and women in relation to their views on the damage that could be caused by aftershocks (p. = 0.20).

Table 19: Damage from aftershocks related to age

Age (% in brackets)	**Damage from aftershocks**		
	More or as much as original	None or less than original	Total
16-30	21 (66)	11 (34)	32 (100)
30-50	51 (62)	31 (38)	82 (100)
50 and over	41 (50)	41 (50)	82 (100)
Total	**113 (58)**	**83 (42)**	**196***

*Three respondents did not answer the question about when aftershocks occur. Two had not made any preparations. All three were over 50. One respondent did not provide an age.

Table 19 shows that 34% of under 30s held the view that aftershocks would cause less damage than the original, whereas 38% of the 30-50 group did and 50% of the over 50 group. Although the differences between ages is not statistically significant (p. = 0.17) this may nevertheless be an indication that the older groups had less knowledge on this issue – perhaps a product of more recent education influencing knowledge about earthquakes.

Only 2% if the population thought being in a lift during an earthquake was a safe place. These four respondents had done some preparation, three were male, and two had tertiary qualifications.

In response to a question about where most damage occurs, only 35% said to the contents of the home, whereas nearly 60% said to the structure of the house. This was then related to whether respondents had prepared for an earthquake or not, and Table 20 shows the results.

Table 20: Where most costly damage occurs related to preparation for earthquakes

Preparation (% in brackets)	**Where most costly damage occurs**		
	Structure of house	Contents of home	Total
No	30 (70)	13 ((30)	43 (100)
Yes	86 (60)	58 (40)	144 (100)
Total	**116 (62)**	**71 (38)**	**187* (100)**

*A number of respondents did not answer the question about damage.

Table 20 shows that 40% of those who had done something to prepare for an earthquake believed the most costly damage would occur to the contents of the home, whereas 30% of those that had done nothing believed this. This tendency provides some support for the idea that being able to deal with more controllable issues – like securing the content of your home - may lead to a greater likelihood of preparation, but the associations are not statistically significant (p. = 0.23).

In response to a question asking what size earthquake would give a measurement of 7 on the Richter scale – over 85% stated big to major. Only one person stated that it was a small earthquake. This suggests that the public have a good level of understanding of scales of magnitude. Table 21 shows the public's views of the likelihood of a damaging earthquake (that is, a more than 50% chance of an earthquake that would cause damage to chimneys and minor structural damage) and the likelihood of a major earthquake (which would cause massive destruction of buildings).

Table 21: Likelihood of damaging and major earthquake

When	Damaging (%)	Major (%)
within one year	19	4
within ten years	39.5	18
within fifty years	22	38.5
within 100 years	4	17.5
over 100 years	1	4
Don't know	14.5	18
Total	**100**	**100**

Table 21 shows that 58% stated that a damaging earthquake would occur within 10 years, with 60% believing a major earthquake would occur within 50 years. This is an exaggerated version of the probabilities given by scientists, where the probability of a major earthquake occurring is not thought to be 50% within the next 100 years, and a damaging earthquake is likely within 50 years – and not 10. This does not support the view that the public under-estimate the chances of an earthquake occurring. In fact they over-estimate the likelihood of earthquakes.

Table 22: When a damaging earthquake will occur related to gender

Gender (% in brackets)	Probability of damaging earthquake occurring					
	Within 1 yr	Within 10 yrs	Within 50 yrs	Within 100 yrs	Over 100 yrs	Total
Female	24 (24)	41 (41)	30 (30)	6 (6)	0 (0)	101 (101)**
Male	14 (20)	38 (54)	14 (20)	2 (3)	2 (3)	70 (100)
Total	**38 (22)**	**79 (46)**	**44 (26)**	**8 (5)**	**2 (1)**	**171* (100)**

*Twenty-nine respondents did not answer the question about likelihood of a damaging earthquake occurring. 19 were female and 10 male.

** Due to rounding procedures this figure does not come to 100%.

Table 22 shows that 65% of women that answered stated that a damaging earthquake would occur within 10 years, whereas 74% of men did –

suggesting men expect earthquakes more frequently. The relationship was, however, not statistically significant (p. = 0.21).

Table 23: When a major earthquake will occur related to gender

Gender (% in brackets)	**Probability of a major earthquake occurring**					
	Within 1 yr	Within 10 yrs	Within 50 yrs	Within 100 yrs	Over 100 yrs	Total
Female	5 (5)	20 (21)	47 (49)	18 (19)	6 (6)	96 (100)
Male	3 (4)	16 (24)	30 (44)	17 (25)	2 (3)	68 (100)
Total	**8 (5)**	**36 (22)**	**77 (47)**	**35 (21)**	**8 (5)**	**164* (100)**

*Thirty-six respondents did not answer the question about likelihood of a major earthquake occurring. 24 were female and 12 male.

Table 23 relates views on when a major earthquake will occur to gender, and again there was no statistically significant difference between men and women (p. = 0.72).

Table 24: When a damaging earthquake will occur related to age

Age (% in brackets)	**Probability of damaging earthquake occurring**					
	Within 1 yr	Within 10 yrs	Within 50 yrs	Within 100 yrs	Over 100 yrs	Total
16-30	4 (14)	14 (48)	11 (38)	0 (0)	0 (0)	29 (100)
30-50	14 (19)	38 (51)	17 (23)	6 (8)	0 (0)	75 (101)**
Over 50	20 (30)	26 (39)	16 (24)	2 (3)	2 (3)	66 (99)**
Total	**38 (22)**	**78 (46)**	**44 (26)**	**8 (5)**	**2 (1)**	**170* (100)**

*Twenty-nine respondents did not answer the question about likelihood of a damaging earthquake occurring. 19 were female and 10 male. One respondent did not provide their age.
** Due to rounding procedures this figure does not come to 100%.

Table 24 relates views on when a damaging earthquake will occur with age. Although there was no statistically significant differences between the age groups (p. = 0.11), 62% of the 16-30 age group who answered stated that a damaging earthquake would occur within 10 years, whereas around 70% of the 30 and over age groups believed this.

Table 25: When a damaging earthquake will occur related to views on whether scientists tell all about earthquake prediction

Scientists tell all (% in brackets)	**Probability of damaging earthquake occurring**					
	Within 1 yr	Within 10 yrs	Within 50 yrs	Within 100 yrs	Over 100 yrs	Total
Yes	18 (22)	40 (49)	19 (23)	3 (4)	1 (1)	81 (99)**
No	20 (22)	39 (44)	25 (28)	4 (4)	1 (1)	89 (99)**
Total	**38 (22)**	**79 (46)**	**44 (26)**	**7 (4)**	**2 (1)**	**170* (99)****

*Twenty-nine respondents did not answer the question about likelihood of a damaging earthquake occurring. 1 person did not know whether scientists told all.
** Due to rounding procedures this figure does not come to 100%.

Table 26: When a major earthquake will occur related to views on whether scientists tell all about earthquake prediction

Scientists tell all (% in brackets)	**Probability of a major earthquake occurring**					
	Within 1 yr	Within 10 yrs	Within 50 yrs	Within 100 yrs	Over 100 yrs	Total
Yes	2 (3)	17 (22)	37 (49)	17 (22)	3 (4)	76 (100)
No	6 (7)	19 (22)	40 (46)	17 (20)	5 (6)	87 (101)**
Total	**8 (5)**	**36 (22)**	**77 (47)**	**34 (21)**	**8 (5)**	**163* (100)**

*Thirty-six respondents did not answer the question about likelihood of a major earthquake occurring. 1 person did not know whether scientists told all.
** Due to rounding procedures this figure does not come to 100%.

Tables 25 and 26 relate views on when an earthquake will occur to opinions on whether scientists tell the public all that they know about earthquakes. There was no difference between the groups who felt that scientists did or did not tell all and the respondents' predictions on when a damaging earthquake will occur (p. = 0.70) or when a major earthquake will occur (p. = 0.73). This suggests that the public's views on the probability of earthquakes occurring does not relate to their trust in scientists, whether their views are exaggerated or not.

Respondents were asked if they knew what a tsunami was. Only 11 said no, and 189 said yes. Of those who said yes most answered that it was a tidal wave, a big wave, a wave that floods the land, or a wave from an earthquake. Only one respondent believed they were caused by storms, and one that they were a terrible whirlwind (possibly confusing it with a tornado). Again there was a good level of basic knowledge about the existence of tsunami and what they were.

Respondents were also asked what could be done to protect Wellington from a tsunami. The responses are shown in Table 27. Only 9.5% suggested a sea wall, 64% had no idea or thought there was nothing that could be done, and 7.5% thought that Wellington was naturally protected. This suggests that there is a discrepancy between the public's views of what can be done for tsunami and the view of at least some scientists.

Table 27: What can be done to protect from tsunami

Description	**Responses**
Barricade/sea wall	19
Early warning system	17
Build away from susceptible areas	30
Education/awareness	11
Evacuation plans/CD set up	12
Wellington naturally protected	15
Don't know	57
Not much	36
Nothing	47
Total	**244**

Table 28: Warning time before tsunami hits

Time	Responses	% of total responses
No time	19	9.5%
Within 5 minutes	10*	5%
5-30 minutes	12	6%
30 minutes – 3 hours**	44	22%
3 –24 hours	13	6.5%
24 hours – 1 week	5	2.5%
A lot	2	1%
Don't know	17	8.5%
It depends	45	22.5%
not much	32	16%
some time	1	0.5%
Total	**200**	**100**

* Includes responses of "few minutes" and "minutes"
** Includes 1 greater than 2 hours response, 1 minutes to a few hours response, 11 "hours" response, and 5 less than one hour responses

Table 28 shows the responses to a question asking how much warning time would be given before a tsunami hits. There was quite a range of responses to the warning time question, with the mode being "It depends" and "between 30 minutes and 3 hours" – both at 22%. The diversity of responses again indicates a low level of shared understanding about this issue by the public.

There were 121 respondents who stated that they had talked to someone within the last year about the possibility of a big earthquake happening in Wellington. Table 29 gives a break down of whom they talked to.

Table 29: Whom respondents talked to about earthquakes happening

Person	Responses
No one	79
Family members	75
Friends	61
Workmates	28
Neighbours	9
Partner	8
School/kindie etc	6
Other	12
Total	**274**

Table 30: Whom respondents talked to about earthquakes happening related to gender

Gender	Who respondents talked to about earthquakes				
	No one	Family	Friend	Workmate	Total
Female	44	53	41	12	150
Male	35	22	20	16	93
Total	**79**	**75**	**61**	**28**	**243***

*There was more than one answer per respondent.

Table 30 relates gender to whom respondents talked to, and Table 31 relates age to whom respondents talked to. Of the 79 who had not talked to anyone, 44 were women and 35 were men. From Table 30 it can be seen that women were more likely to talk to family and friends, and men more likely to talk to workmates.

Table 31: Whom respondents talked to about earthquakes happening related to age

Age	Who respondents talked to about earthquakes				
	No one	Family	Friend	Workmate	Total
16-30	16	8	11	3	38
30-50	25	32	26	17	100
50 up	38	34	24	8	104
Total	**79**	**74**	**61**	**28**	**242***

*There was more than one answer per respondent.

The 30-50 age group were more likely to talk to workmates, as would be expected. There was no statistically significant difference between those that had talked to no one and those who had talked to someone in terms of gender (p. = .31) and age (p. = .30).

Preparation Issues

This section looks at responses to questions relating to issues of preparation, and relates these to other questions in the survey.

Table 32 lists the most popular six responses to a question asking what the respondents could do to prepare for a major earthquake, and compares this with what they have done and what they know others have done. There were many more responses that were given by only a few people.

Table 32: What can be done to prepare for earthquakes compared to what has been done and what respondents have seen others do

Preparations	Can do	Have done	Seen other do
Nothing	4	47	
Water	136	103	53
Food	132	102	56
Secure furniture	86	30	20
Family plan	70	34	15
Prepare kit	65	47	41
Radio	57	36	11

Table 33: Knowing others have prepared related to preparation

Preparation (% in brackets)	Seen others prepare		
	No	Yes	Total
No	38 (81)	9 ((9)	47 (100)
Yes	60 (39)	93 (61)	153 (100)
Total	**98 (49)**	**102 (51)**	**200 (100)**

Table 33 relates preparation to whether respondents knew of others who had prepared, and Table 34 shows who respondents knew who had prepared for earthquakes.

Table 34: Who respondents know who have prepared for earthquakes

Person	**Responses**
No One	98
Friends	59
Family members	44
Neighbours	12
Workmates	10
School/Kindie etc	8
Talks at work	5
Club members etc	2
Total	**238**

What can be taken from Table 32 is that nearly one-quarter of the population had done nothing, although only 2% thought they could do nothing. Around two-thirds know they can put water or food aside, but only half do so. Other than those two actions, there is not a strong response for any category about what can be done. There is also a very strong association between seeing others preparing and having made some preparations (p. = <0.0001), with 81% of those who had not prepared having also not seen others prepare. This fits with the findings of Turner, Nigg and Paz (1986) that personal contacts are important in preparation. Table 34 shows that friends and family are very important in this regard.

Table 35: Preparation related to age

Age (% in brackets)	**Preparations**		
	Yes	No	Total
16-30	20 (62)	12 (37)	32 (99)**
30-50	68 (83)	14 (17)	82 (100)
Over 50	65 (76)	20 (24)	85 (100)
Total	**153 (77)**	**46 (23)**	**199* (100)**

*One respondent did not provide their age.
** Due to rounding procedures this figure does not come to 100%.

Table 35 relates preparation to age groups. Although the differences here are not statistically significant (p. = 0.06), it can be seen from this that 37% of the 16-30 age group have made no preparations, whereas 17% of the 30-50 age group and 24% of the 50 and over age group have made no preparations. What can be suggested here is that the middle grouping is more conscious of earthquake risk, being more likely to have family at home for example. The younger group may be more prepared to "take the risk" and not prepare. The older group may include some of those older people living alone who may not feel so capable of preparing. This is hard to tell from the data as, for example, only 16 respondents classified their marital status as widowed, and only 6 of these had made no preparation (or 37%).

View of scientists

This section looks at responses to questions about scientists' abilities to predict earthquakes and whether scientists tell the public all they know about earthquake prediction. Respondents were asked to rate the ability of scientists to precisely predict an earthquake – that is – predict location and magnitude. The results are shown in Table 36.

Table 36: Ability of scientists to predict earthquakes

Scientists' ability	Responses	% of total responses
No ability	17	8.5%
Low	40	20%
Some	111	55.5%
High	29	14.5%
Don't know	3	1.5%
Total	**200**	**100**

Just over 14% thought that scientists had a high ability to predict earthquakes, with 20% rating their abilities as low. However, 70% thought scientists had some or a high ability to predict earthquakes. Turner, Nigg and Paz (1986) argued that their finding of 42% who believed this in California indicated an over confidence in current scientific capabilities. This would make Wellingtonians very over confident. However, it is difficult to really know what respondents mean by "some" ability, and Turner, Nigg and Paz perhaps read too much into this. Table 37 relates opinions on whether scientists tell all they know about earthquake prediction to ratings on scientists' abilities to predict earthquakes.

Table 37: Belief that scientists tell all they know about earthquakes related to opinions about scientists' abilities to predict earthquakes

Scientists' ability (% in brackets)	Do scientists tell all they know about earthquakes		
	Yes	No	Total
Don't know	1 (50)	1 (50)	2 (100)
No ability	8 (47)	9 (53)	17 (100)
Low	15 (38)	24 (62)	39 (100)
Some	59 (54)	50 (46)	109 (100)
High	12 (43)	16 (57)	28 (100)
Total	**95 (49)**	**100 (51)**	**195 (100)***

*Five respondents did not provide an answer to the question on whether scientists told the public all they knew.

There was no statistically significant association between respondents' ratings of scientists ability to predict earthquakes and their opinion that scientists did not tell the public all they could about earthquake predictions (p. = 0.51). If it was found that scientists were rated highly on their abilities to predict earthquakes and were seen as not telling people about it, this could support a view that the public saw scientists as experts who were not giving out appropriate information. This does not appear to be so with this population. Table 38 relates preparation for earthquakes to ratings of scientists' abilities to predict earthquakes.

Table 38: Preparation for earthquakes related to opinions about scientists' abilities to predict earthquakes

Scientists' ability (% in brackets)	Preparation for earthquakes		
	Yes	**No**	**Total**
Don't know	3 (100)	0 (0)	3 (100)
No ability	11 (65)	6 (35)	17 (100)
Low	33 (82)	7 (17)	40 (99)**
Some	84 (76)	27 (24)	111 (100)
High	22 (76)	7 (24)	29 (100)
Total	**153 (76)**	**47 (23)**	**200 (99)****

*Five respondents did not provide an answer to the question on whether scientists told the public all they knew.
** Due to rounding procedures this figure does not come to 100%.

There is no statistically significant association between the respondents' ratings of scientists ability to predict earthquakes and whether they had made some preparations or not (p. = 0.54). This indicates that an overly optimistic view of scientists' abilities has no relation to preparation.

Respondents were also asked whether others could predict earthquakes. A total of 31% of respondents believed that someone else besides a scientist could predict a major earthquake. 20% of all respondents believed that animals knew when earthquakes were coming, and 8% believed that psychics could predict when earthquakes were coming. This 8% had a similar profile as the rest of the respondents in terms of rating scientists' ability to predict earthquakes. In other words – believing in psychics' abilities did not seem to discourage or encourage people from believing in scientists' abilities. Similarly, this 8% were evenly split, as with the total respondents, over whether scientists told the public all they could about their predictions of earthquakes. In addition, only 2 out of the 16 who believed in psychics' abilities to predict earthquakes had done nothing to prepare for earthquakes – again indicating that holding beliefs that might be seen as anti-science appears to have no bearing on earthquake preparedness. Table 39 related opinions about non-scientists' abilities to predict earthquakes with opinions about scientists' abilities. There is no statistically significant difference between the ratings of scientists' abilities to predict earthquakes and views on whether others can predict earthquakes (p. = 0.63).

Table 39: Opinions about Non-scientists' abilities to predict earthquakes related to opinions about scientists' abilities to predict earthquakes

Scientists' ability (% in brackets)	Can anyone else predict earthquakes		
	Yes	No	Total
Don't know	1 (33)	2 (66)	3 (99)**
No ability	6 (35)	11 (65)	17 (100)
Low	14 (35)	26 (65)	40 (100)
Some	29 (27)	78 (73)	107 (100)
High	12 (41)	17 (59)	29 (100)
Total	**62 (32)**	**134 (68)**	**196* (100)**

*Four respondents did not provide an answer to the question on whether anyone else can predict earthquakes.
** Due to rounding procedures this figure does not come to 100%.

Respondents were asked whether they thought scientists tell the public all they can about their predictions of earthquakes. Exactly 50% said no, replicating the results from the 1986 study in California carried out by Turner, Nigg and Paz. Respondents were then asked why they thought scientists withheld information. For 70% of the 100 who answered this question it was to prevent panic, and for 30% it was because scientists did not give out information that they were not certain about.

Respondents were asked if they thought there were any signs of an earthquake coming and 70%, said yes. They were then asked what these signs were. For 39% of all respondents changes in animal behaviour were seen as a sign of an earthquake coming (this compares with 68% in the Turner, Nigg and Paz study). For 27% of all respondents some atmospheric change was mentioned (compared to 43% in the Turner, Nigg and Paz study). This included stillness and other atmospheric changes, water and sea changes to simply stating "earthquake weather". Wellingtonians appear to be more over-confident than Californians in scientists' abilities, and fewer Wellingtonians hold folk beliefs.

Table 40: Folk beliefs held related to opinion on whether scientists tell all they know about earthquakes

Scientists tell all they know about earthquakes (% in brackets)	**Folk beliefs held**		
	No	Yes	Total
No	43 (43)	57 (57)	100 (100)
Yes	47 (49)	48 (51)	95 (100)
Total	**90 (46)**	**105 (54)**	**195* (99)**

*Five respondents did not provide an answer to the question on whether scientists told the public all they knew.
* Due to rounding procedures this figure does not come to 100%.

Table 40 shows that belief that there were atmospheric or animal behaviour signs of an earthquake coming (labeled as folk beliefs) did not have an effect on whether respondents believed that scientists told all they could about earthquake prediction (p. = 0.36). In other words, although people believed there were these other signs, what we could call folk beliefs as they are held by the people and not the scientists, they did not appear to relate this to the work that scientists do. They were no more or no less likely to trust scientists than the rest of the population. The caveat here is that the population appears to have a low level of trust in scientists anyway.

Table 41: Folk beliefs held related to preparation for earthquakes

Preparation (% in brackets)	**Folk beliefs held**		
	No	Yes	Total
No	22 (47)	25 (53)	47 (100)
Yes	70 (46)	83 (54)	153 (100)
Total	**92 (46)**	**108 (54)**	**200 (100)**

Table 41 shows that of those 108 who held folk beliefs (that is, believed that animals or weather changes are signs of an earthquake approaching), 25 had done no preparation. Of the 92 who did not hold folk beliefs 22 had done

nothing, therefore there was no statistical difference (p. = 0.90). Turner Nigg and Paz suggested that those who were less discriminating in their beliefs about predictability were the most prepared. This is not borne out in Wellington.

Those who held folk beliefs were evenly spread amongst the different age groups, and amongst the different areas of deprivation.

A question was also asked about the source of learning about earthquakes. In retrospect the way this question was phrased does not enable a distinction to be made between gaining information about earthquakes and simply hearing about earthquakes, and so this question is not seen as having much validity.

Effects of concern

Respondents were also asked to rate a list of 10 possible effects from an earthquake in terms of what was least worrying and what was most worrying. Table 42 shows their responses.

Table 42: Respondents level of worry about possible earthquake effects (1 = least worrying, 10 = most worrying)

Effect	Median	Inter-quartile range
Lack of water	8	6.75 – 9
Injury to others	8	6.5 – 10
Gas leaks	8	6 – 9
Fire	7.5	6 – 9
Injury to you	7	5 – 10
Power cuts	7	5 – 9
Building damage	7	5 – 8
Landslips	6.75	4 – 8
Civil unrest	5	3 – 7
Flooding	5	2 – 7

Notably lack of water rates very high – and this is also the most common measure people know about, and the most common preparation made, for earthquakes. Building damage rates reasonably low on this scale. Gas leaks and fires rate reasonably high – and such awareness of the possible effects of fire again indicates good levels of understanding amongst the population about the possible impact of earthquakes.

The media

Respondents were asked to rate the media for accuracy on a five-point scale with 1 being absolutely accurate and 5 being extremely inaccurate. The results are shown in Table 43. The mean rating was 2.63. There was very close agreement here between scientists and the public in terms of media rating, neither being particularly high.

Table 43: Publics' assessment of the accuracy of media coverage of earthquakes

Rating	Responses	% of total responses
1 = absolutely accurate	18	9%
2	78*	39%
3	76	38%
4	12***	6%
5 = extremely inaccurate	15****	7.5%
Total	**199****	**100%**

* Two respondents recorded 2.5. Of these 1 has been converted to 2 and 1 to 3.
** One respondent did not give a response
*** One respondent recorded 3.5. This has been converted to 4.
**** One respondent recorded 6. This has been converted to 5

Table 44 summarises the responses on what respondents think would be the best way for them to find out about preparing for earthquakes. Mail pamphlets and television were rated as the most popular media.

Table 44: Sources to find out best ways to prepare

Sources	Responses
Mail Pamphlets	42
Television	35
Newspapers	19
Civil Defence	17
The Internet	15
Council	14
Radio	12
EQC	10
Your Workplace	9
Phone book	7
Library	5
Other responses*	10
No response	5
Total	**200**

*Includes other category where only one response was given.

Respondents were asked if they had tried to find out more information about preparing for an earthquake in the last year. Only 13% said yes, and the major response was that they had read a pamphlet (7 respondents) or talked with others (4 respondents).

Table 45: Information seeking related to preparation for earthquakes

Information seeking (% in brackets)	Preparation		
	No	Yes	Total
No	46 (27)	127 (73)	173 (100)
Yes	1 (4)	25 (96)	26 (100)
Total	**47 (24)**	**152 (76)**	**199* (100)**

*One respondent did not state whether they had sought out information

Table 45 shows that 96% of those who sought information made some preparations, a far higher proportion making preparation compared to those who had not sought information (p. = 0.01). This supports Mileti and Fitzpatrick's Californian findings that preparedness for earthquakes was more affected by people seeking information than any other variable.

Summary

The following summarises the main points from the survey of the public.

- Very few of the Wellington public are consistently fatalistic. Wellingtonians believe that preparations will be helpful.
- Younger age groups are less likely to be affected by a minor earthquake. In addition, those who are less responsive to minor earthquakes (that is, neither less nor more worried after them) are more distrustful of scientists. This group may be less responsive to messages from "experts".
- Few people are aware of how long it can be before an aftershock occurs, and people who believe that aftershocks can only occur very soon after an earthquake are less likely to prepare for an earthquake
- The public has good knowledge about the possible damage from aftershocks, with only 2% believing they do not cause damage.
- The public has good knowledge about tsunami and magnitude of earthquakes.
- The public has little knowledge about what can be done to protect Wellington from a tsunami, and have diverse views on warning times given for tsunami. Efforts could be made to raise awareness about tsunami issues.
- The public over estimates the chances of earthquakes occurring, but this bears no relationship to trust in scientists. In other words, the public does not hold a different view from scientists about the chances of earthquakes occurring because they do not trust scientists. The different view held by the public from the scientists probably relates to the media dramatisation of earthquake reports.
- There is reasonable knowledge about what can be done to prepare for an earthquake, but far fewer have made more than a few preparations.
- There is a strong relationship between preparing for an earthquake and knowing others who have prepared. This emphasises the importance of personal contacts in earthquake preparation.
- It appears that the middle age grouping (30 to 50) are more likely to prepare – although this was not statistically significant.
- Views on scientists' abilities to predict earthquakes does not relate to preparedness
- Nearly one third of the population believe there are non-scientists (and even non-humans) who can predict earthquakes. For most of these people animals were seen as being able to predict earthquakes and only 8% believed psychics had that ability. Over half the respondents held folk beliefs about the signs of an impending earthquake, but holding these beliefs does not relate to preparedness, or ratings of scientists' abilities to predict earthquakes.

- People are most concerned about lack of water following an earthquake and injury to others, but also show concern about fire and gas leaks.
- The public rated the accuracy of the media close to a neutral point (only slightly accurate), and their rating was very similar to the scientists' accuracy ratings of the media.
- Those who actively seek information are most likely to prepare.

Analysis of Focus Groups

A great deal of discussion was generated in all the focus groups, and they took between 65 and 90 minutes. Almost all the participants were highly articulate, and appeared to be well educated. In most focus groups there was a predominance of women. This was not intended but related to who turned up at the time and from an initial starting point of more women than men partaking in the survey. On the whole men did not seem to be too dominant in the conversation, or at least not overpoweringly so. The participants were not identifiably other than New Zealand European or British. The focus groups were carried out in a friendly atmosphere, and even where there were differences of opinion there did not appear to be any signs of anger or antagonism.

The following discussion outlines the themes from the focus groups and provides examples to illustrate the themes. The concluding comments attempt to convey the overall sense of the focus groups. It is not suggested here that the focus groups are representative of the population or that they capture all views. However, they do provide us with insight into some of the issues surrounding the communication of earthquake risk, particularly for articulate, well-educated, Pakeha New Zealanders.

Reaction to earthquakes

Within a couple of weeks prior to the focus groups two earthquakes had been felt in the Wellington region. These earthquakes occurred in the very early hours of the morning when most people were in bed. As an icebreaker, but also as a way of exploring immediate responses to earthquakes, participants were asked to describe what they did and why. Only a few of the participants took any active response to the earthquakes, and this mainly related to concern about children.

> I leapt out of bed and I was half way to my baby.
>
> I woke up and I ran upstairs to my screaming daughter.
>
> Got out of bed and checked the kids. Went straight to the kids' room.

These participants did not attempt to protect themselves. One other person got up to check for property damage and one looked after a terrified kitten. However, most participants took no action. For some this related to a blasé attitude, exhibiting a lack of concern:

> I just thought – 'oh there is an earthquake', and then I went back to sleep.
>
> I was awake. It didn't worry me at all. I didn't move.

For others there was concern, but still no action:

> I kind of sat at the end of the bed thinking 'should I run, is this going to be the big one?' If it had gone on for any longer or gotten any bigger I would have run.
>
> I woke up and lay there and waited...it flashed through my mind 'if this keeps going what should I do'.
>
> I woke up and I waited there for it to stop...it is stupid really, you just wait there for it to stop.

Respondents were then asked why they did not move. The general response was based on waiting to see if it would go on or get more severe. For others there was confusion about what to do, or panic:

> I did wake up and thought – what are you supposed to do. Are you supposed to open the windows? I was just thoroughly rattled...I just stayed in bed and kept my fingers crossed.
>
> You just quietly panic.
>
> I don't know if it is complacency or a felt lack of ability to do anything about it if it does happen – that you are powerless to do anything so you sit there and wait it out basically.
>
> I live alone and I get myself into a panic about it. I get really rattled about earthquakes. I was not born here so they are a great terror to me and they really scare me stiff but there is nothing you can do about it.

For some they were too tired to react to an earthquake occurring in the early hours of the morning. But the most common response was one of having a blasé/ho-hum attitude:

> I could hear the rumbling. And I guess it is living in Wellington all your life you get a little bit ho-hum. Let's wait and see what happens.
>
> Perhaps there is a bit of immunity to these smaller ones. In my experience the bigger ones have never been in Wellington – they have been all around it.
>
> I think the more smaller ones you have the more complacent you get.

This blasé attitude could also be a survival tactic:

> You don't want to be getting up in the middle of the night because a truck has gone past and has shaken the ground a little bit.
>
> And that ho-hum thing might be a little bit of an emotional survival tactic in Wellington. If you were jumping at every tiny thing you would be feeling anxious all the time.

In one focus group there were a number of younger adults, and they noted a social pressure not to react:

> Yeah – it is like that at my office. There was quite a big one, last year or the year before. It is right on top of a big building – twenty-something stories up, and you just feel everything. It was the first one in our new building and everyone was just sitting there looking at each other for about a minute. It was quite a long one, and everyone felt a bit stupid if they got under their tables. So they were just waiting and seeing what everyone else was doing. (Laughter) – It is a bit geeky [to react]. Actually my boss got under the table and we all laughed at him.

In sum – there were few that reacted, and they mostly did so for the sake of children. Many did not react, and this was rationalised on a number of grounds. Most commonly this was due to the normal experience of minor earthquakes in Wellington, making the situation ho hum, and the recognition that to live in Wellington you need to take these things in your stride. However, there were some who were too terrified or confused to react, and social pressure not to be seen as a "geek" might influence some people.

Responses to earthquakes

Participants also reacted to earthquakes at a number of different levels. For a few the experience of an earthquake was exhilarating, one participant stating that "you start to think about how powerful nature is and all that sort of stuff". For a number there was an academic interest in earthquakes:

> I was sitting up, and the first thing I did was start counting, using the time between when the first wave hits and the second wave, you can try and figure out where it is coming from. My partner asked what I was doing and I was just going '1,2,3,4' and all of a sudden you felt this kind of rolling and she said 'why aren't you under the door'. I said 'old habits die hard'.

A more common response was one of concern for family:

> I think what perhaps opened our eyes more to the possibility of what would happen when Wellington was shut off say from the Hutt and Johnsonville were the big floods that happened in 1967. When if you were working in town there was no way you could get home to your children if you lived in the Hutt or Johnsonville or anywhere else. And I think that brought home to you more than anything that you may well be cut off from family. With Mum and Dad out somewhere else those kids would have needed to cope for themselves until you were able to get home or things like that. But then you are not thinking of the destruction of everything around you, you are thinking of the roads.
>
> My feelings were 'if it is going to be the big one, good, we are all at home together and it is not like he is in town and I am somewhere else. I felt a bit of relief – I like them when we are all at home rather than that separation thing, and in town it is more dangerous I think, with things falling on the street. So I always hope we will all be at home.
>
> Since I have had children – like with my first baby when we brought her home – the very first night I was just completely obsessed by the fact that there could be an earthquake in the middle of the night, and it was raining and we would have to go outside maybe with this new born baby. That

> really got me going, but I must admit that since I've got a bit slack, we are kind of half way there. It is not so much the physical danger of things falling on your head – its like if we are scattered how do we get that back together again.
>
> That's why you are better at night - I like the night jolts – because everyone is together.

Why don't people prepare?

Much of the focus group discussion was taken up with the issue of why it is that, even though most people know the sorts of things they can do to prepare for an earthquake, many only do a few things and a substantial number of people do nothing at all. Again, a very common response was that people were blasé about earthquakes in Wellington:

> I think in all honesty, in our case, it is totally and utterly blasé. We have always lived life on the edge, and we haven't taken any precautions so far in our married life and I don't think that we are going to now.

This attitude seemed to prevail despite a mirror falling down on her daughter's head during an earthquake. Associated with this attitude was a view that preparing for earthquakes was too much hassle.

> We've always had what we call the earthquake bag – a bag with all the stuff in it, the tinned food, the cat food and the toilet roll. And we have got all the water supply. But that's has always been there. But there have only been moderate to small earthquakes and you get a 'she'll be right' attitude. And so you don't go in to strapping the water tank because it is too much hard work to do it.
>
> And even when you set up your kit and things you are supposed to go back and empty your water every 3 months and stuff, which is a hassle. It is not like you can just store it away once. You have got to keep checking your batteries and other things.
>
> Why I wouldn't screw things to the wall is that first of all you have got to find the wooden bit behind, you have got to move all your furniture out – and then if you ever want to change your furniture around you have got these great big, dirty messy holes stuck behind – I mean that might not be a good reason for not doing it but that might be one reason when I come to wanting to sell the house.

Similarly, people in rental accommodation did not want to put "a hole in the wall" to secure furniture as they were in someone else's house. A blasé attitude could also be associated with an anti-materialist view:

> I was watching the [EQC] advert on the TV beside the bookshelf, which is built in. And I was looking around and thinking – 'well those vases could fall down but I am not going to cry too much about that. And I had a look around the lounge and I thought – 'no, there is nothing really in here that I want to save'.

Another theme related to the uncertainty of predictions about earthquakes, creating a lack of urgency:

> I have done a certain amount – but you could go on forever trying to protect yourself. You don't know if and when it is going to happen. If you had some definite date where you would have to have it all done by that week then we would probably get down and do it. But we haven't got urgency.
>
> I think a lot of it is not knowing when it is going to hit and thinking we are just going to get minor ones we won't really get a big one for a long time. There were a lot of people who prepared for Y2K because there was a set time... But with an earthquake you don't really know and you can think 'I can do that some other time'.
>
> I believe that there is not going to be a big one, not in my lifetime – I hope.

Participants also noted that there are more important priorities for people:

> One of the issues that we have got is that with 3 teenage daughters we are so busy making sure that they haven't got anorexia, that they are not doing this and they are not doing that – I haven't got time to be worried about other issues as well. So it is not just about living in preparation for an earthquake. Life is hard, it is tough, and you have got to get on with it. You have got to get to work; you've got to get the children to school. Perhaps in defence of my blasé approach – there are other issues that are very important on a regular daily basis rather than preparing for this one earthquake.
>
> We have thought about it but that is as far as it has got.
> *Facilitator* - Why?
> Probably because it is low on the list of things to be done – there is always something that needs doing. Today for instance we put a light bulb in, and we have been in the house for over 10 years and it was dead when we went in there. The light bulb has actually sat on the kitchen bench all that time – it is a funny shaped thing – and today we did it. So one day we will get around to it. That is how long it takes us to get things done.

Participants also mentioned economic issues:

> I know that we have had food, occasionally, in our earthquake box, and we are on a low income and when times have been leaner we have eaten it.
>
> I have done lots of things. I know where the gas and the water are and all the family is trained up to do that. We've some of the shelves tied up...There are some structural things that I have not thought about and the reason I have not thought about those is that they are big cost items.

Participants also noted that even though they knew certain things should be done, they did not feel practically able to do them:

> I was just thinking, how capable are we of strapping our hot water? We don't even know where the tank is I don't think.

> I can't even get my husband to put up a cup hook – so I don't know how you would manage – truly.
>
> There are lots of things to do, and it is quite an effort. When I was thinking about preparing...I got stuff from the City Council and a list of things, and it was really long. And I was trying to do them all and it was just a real effort...And doing some of the things, like strapping the water tank, it's a sort of technical thing, and by the time you get up in the roof...It's like it has to be really easy to do it, even though there is quite a lot at stake potentially.
>
> *Facilitator* - What makes you decide not to prepare? (to older lady)
> I can't.
> *Facilitator* You mean the practicality of it?
> Yes.
>
> Well I think if you screwed anything to my walls it would immediately fall down. It is really badly built...
>
> I have thought about [strapping up my hot water cylinder] but I have thought, well, are the eaves in the right place and how much of that stuff will I need to buy and whether I have the right sort of drill.

Even where they were practically able to make more preparations some participants were resistant due to aesthetic considerations:

> And the mobility of being able to move things around when they are screwed to the walls. People do like to shift furniture around occasionally.
>
> I like to move my furniture and if it is screwed to the wall...

Another reason cited by participants was a lack of information about what to do, or confusion:

> I don't have any food put aside. But I get quite confused about the food issue. Am I supposed to have a box in a garage strictly for the earthquake or should I make sure that I have enough tinned food in the house? I am quite confused about that. What is the answer?
>
> There are all sorts of problems if you think about it. One problem, if you think about it, is water. We have a huge canister of water in the garage, but the garage is under the house. I don't know where to put it. Do I put it on the top, or do I put it on the bottom with the likelihood that I would never get to it?

Some did express a fatalistic attitude or a sense of powerlessness:

> Probably wherever you have it [food] stored that is the first place that will be destroyed.
>
> I also have the sense that if it is really as big as that and as bad as they say it is going to be, is there really anything we can do.

> People do feel powerless in the sense that they can store water and have ropes to lower themselves down form heights in buildings and all those sorts of things – are they going to be able to utilise the equipment when the time comes?

In contrast to this some expressed a faith in the building standards:

> Well the house I live in has been there for about 70 years, and there has been earthquakes and the lord knows what else in that time – but it is still standing. So it is going to take a pretty big shake to destroy it.

> I have some faith in building codes – I am pretty relaxed if I am in our building – it has got a lovely movement in it when you get an earthquake. A rocking, gentle, lulling movement. And I assume a building ten years old will be able to withstand a decent one.

At another level, some participants expressed anti-risk sentiments, arguing that we can't think about protecting ourselves all the time:

> one of the things I noticed when I came back here was that people were terrified by lots of things. A lot of people rule their lives with fear, and I spend my time trying not to rule my life with fear.

> *Participant A* - You have just got to get on with living and I can't be bothered with it all. That is how I approach it and that is how I try to present it to my children. I don't want them growing up with all this fear either, and all this misery and gloom.
> *Participant B* – Yes I agree with that. I was just thinking of schools where there is this whole stranger-danger thing. It is really big in the schools – I can't believe it. I hate it, I really hate it. And then you have this whole earthquake thing on top of that.

> I'm not anxious at all. I just don't think about it and maybe it is a protection mechanism for myself. Not even thinking about the fact that there could be a big one. I am totally unprepared if a big earthquake struck. Denial.

> You can't sort of live on that plane all the time can you? I know someone that does and they will never go through any of the tunnels. I mean, you probably wouldn't cross the road if you think of crisis all the time.

A related issue was a reaction against the regulation of people's lives:

> I think there seem to be so many restrictions these days – now we have to wear seatbelts, now we have to have hats on when we go on the bike. Year by year there appear to be more and more restrictions and maybe this is just another thing that we should do but…

> You can't put yourself in cotton wool for the rest of your life. There is danger in everything, I mean just children coming home from school these days…I think there are good things that come out of these things. I think it is good not to die in a car accident, it is good that we learn not to smoke. I think all these things are good – it's a matter of how far we take them all I suppose.

Some participants also considered the idea that not experiencing a major earthquake could hinder preparations:

> Do you think it is a generational thing too, that there are not too many people around at the moment who have actually experienced people being killed in New Zealand by earthquakes.
>
> I don't think we actually get enough earthquakes in Wellington to really be prepared. We are told that we are going to get a big one – and it is going to catastrophic with all our high rise buildings and built on fault lines and things. That is the way I feel, it is not so much that we are blasé about it, it is just that I don't think people experience enough of them to think that this is a threat and that we need to do something about it.

Why do people prepare?

Given the varieties of rationales provided for not preparing for an earthquake an equally interesting issue is why do people prepare at all. A major factor in earthquake preparation for participants was concern for family and friends:

> I think for me the property issue isn't nearly such a big deal as people losing their lives, or people being very distressed because they are cut off from their mother or father. I think for me they are the issues I want to try and take a bit of control over.
>
> Most of the preparations that we have done, apart from screwing things to the wall, is geared to life. There is very little we can do for the building. But everything else we do, like prepare water, all that is for us, not to protect the building.

A not uncommon motivation for preparation was the influence of schools:

> [the children] are much more in tune with it. It seems to be sort of working in schools as far as my experience has been anyway....they are on to me about it and I feel, well, I think I will put a bit of blue tack under my china (laughter).
>
> Having worked in [a school] we have to do a session every term where we do an earthquake drill and the children have to get under their desks and practice. And now the schools have to do a mock earthquake and they run emergency plans where you pick up all the children you said you would pick up. That would never have happened in my day...so the kids are more aware of it. The kids are quite happy with it. So I think the next generation will be better than us because it is being started at an early age. And the kids teach us.
>
> What kids are taught at school is quite amazing – and the pressure they put on us as parents! If you teach kids about earthquakes and that then they are probably the ones to get their parents to actually do something.

Others suggested that neighbourhood groups, workplaces or Civil Defence could have more of a role in informing and training people.

> I think that ...you have to find a way of providing actual training to households. Not just workplaces and children because you miss people. You miss elderly and a whole lot of people that don't fit in to either of those two groups...I suppose lots of neighbourhoods have neighbourhood watch schemes already. It could be pushed into some poor organisation like that to take it up.
>
> When we lived in Newlands many years ago they had Civil Defence people coming around to our door and talking people into going down to Civil Defence training, which a lot of us did. And I think that was excellent. It went someway towards preparing people about what they could do in the event of an earthquake.
>
> Our workplace was very organised. We had wardens on every floor and I was involved in recruitment. We had to make sure that all new people received training for a start and we had manuals that told everyone what they should and shouldn't be doing.
> *Facilitator* – Did work preparedness have an effect on home preparedness? I think because you are confronted with it at work it is translated at home. You do think 'they are taking this really seriously so I should too'. Well that was what I felt about it – though I haven't done anything!

A number of participants also noted that the issue of preparedness did not just relate to earthquakes, but to disasters in general:

> I think you have just got to approach like – we have power cuts regularly. So you keep a torch and matches handy, you can't cook food necessarily so you've got food in tins. Your water might get cut off so you have stored some water, and things like that. And those common sense preparations would carry you through for an earthquake or a power cut or anything else.
>
> I think the reaction to what I have done at home, and I am reasonably diligent about the process, is because I am conscious of where I live and I am conscious of tsunamis and those sorts of things. I am right on the water edge and the Eastbourne hills are quite unstable... So I have had to make myself aware of that anyway and that has just brought it home to me that in an earthquake I could be a lot more at risk than most people.

And preparedness was also related to housing conditions:

> I think if I was living in a nice place I would probably do more. It is just that I know that in a big earthquake our flat would just be demolished. So there is not a lot we can do.

Why scientists don't tell us all they know

Another issue discussed in the focus groups related to the finding in the survey that 50% of the public did not believe that scientists told the public all they knew about earthquakes. This finding was explained in a number of ways. One related to past failures leading to a sense of immunity about forecasts:

> It's like the Y2K thing isn't it. I mean everybody got in a great panic about it and it fizzled out. And I think that is what happens here – the same sort of thing. It was pushed that something was going to happen and that it was going to be terrible and nothing happened.
>
> Its been talked at you for such a long time. That it's going to happen and that we are on the fault line.

One participant related this failure to people misinterpreting scientific information, and gave the following account:

> there is a guy from my work and he has just arrived from Scotland just in time for the earthquakes...and he was very nervous about it. And I said 'oh don't worry about it. They just shake things a bit. Forget about it'. And he said 'no, no I have read this leaflet and it said that within ten years in Wellington there is going to be this big earthquake', and he said 'this was published in 1992 and so we have only got two years left'.

A related issue here was the notion of an information gap between the scientists, media and public:

> Most scientists are seen as not being exactly media savvy. They are pretty much in a room somewhere with their white coats on, glasses and a beard down to their knees. So they don't personally know how to get to the media and put their message across. So you get this information gap.
>
> Because they have not had the chance to listen to a scientist or have a scientist explain to them. And I am quite sure a lot of people would be more greatly aware and would take action or prevention if they could if they had listened to someone with that sort of background. But how they get that forum into the public arena I don't know.
>
> I think the scientists in this case probably don't have an avenue to present this information to the public...Papers don't want to put dry articles in. Even if they sent out information via mail to all the homes I guarantee 90% wouldn't even read it because it wouldn't be exciting enough.

Some took a slightly more cynical attitude towards scientists, one arguing that scientists "probably don't think we need to know".

> I think they just must know more. If I can work it out that the ground is hot then they must know that.

A less cynical view looked at the nature of science itself as an issue:

> My own personal opinion is that they give us everything that they feel is safe to give us. Where they are still in an investigative situation and they are not quite sure about the facts they will hold that back, and I think rightfully so.

And some participants saw the movies as an influence on our perceptions of scientists:

> There are a lot of films on television where there is one brave scientist, and he knows, but he is oppressed by the administration above him.
>
> I think it is those movies, - that recent one about 'oh no one is listening to me'. That one where there was the volcano in New York or whereever and the women was saying 'oh no one is listening to me' – and she could have saved them if they listened.

And some expressed the view that there was a general suspicion of scientists anyway, particularly with close links between science and commerce:

> I think it maybe because they see science so much in the pay of profit, and that a lot of scientists with research grants are not independent – they come from big businesses who are out there to make a buck. So I think that people are seeing scientists less and less as there with objective research which is for the pursuit of general knowledge...so there is more suspicion of science now.
>
> It's who's funding them, that's what worries me.
>
> I still think it is a generic response. I think if you did some research you would find that it is not about earthquake research but it is about any research – do they tell us everything they know – and the majority of people would say no. ...We always think that experts know more than we do.

And some rejected the view that scientists don't tell the public all they know:

> I can't think of any reason why scientists would withhold information – why on earth would they do that?

View of the media

Although the participants did not rate media coverage of earthquakes as very reliable, they did note some reasons for this. The media tendency to sensationalise was seen as both a requirement of publication and served a purpose in terms of public education:

> It becomes a dry topic for the media. The media deals in sensationalism. There is no doubt about that and they wouldn't publish the script of a lecture because no one would read it.
>
> The media wants to sell its airtime and papers. So a factual, not very glossy account of what's happening in some earthquake faultline isn't as good as getting you to feel a bit scared about it.
>
> The next [major earthquake] might not be for a thousand years but the paper says it almost going to happen tomorrow. But maybe it is done with good intentions, but maybe it is just sensationalism.

> I think the media, in good faith, portray devastation, and probably in good faith to make people come out of their lethargy and jolting people a little bit.

And some participants did note that the media coverage could be good:

> A couple of years ago there was a map that looked at high risk areas in Wellington and that was good. So that was an instance where quite good, accurate information was getting out there, and they didn't sensationalise it or anything like that.

What could be done to motivate people

Some of the focus group participants came up with ideas about what they thought could motivate people. Some participants suggested that there could be community or action groups involved in motivating people to prepare:

> I think the scientists themselves could offer a lot more if they were given the ability to get out there. They do it through organisations like Rotary Lion and those outfits where they can go and talk and that is very positive as most people carry the message back to their community or family and that is a good way of getting it across.

> Set up companies where people will say 'we will come around and check out your house for earthquake preparedness and strap up your hot water cylinder for you.

Some thought the local councils could have a bigger role:

> In terms of what is in the [EQC] pamphlet about the foundations, I feel that it is a little bit too much for the average householder. But how one can target that aspect is with the Council, through the building permits that they issue and the regulations that they have on various buildings. That would be a very good way to attack that.

But others had less faith in the councils:

> Well councils are notorious – in a lot of these landslides in New Zealand councils have allowed people to build on fill, and things like this. And they've not known until the houses have slid half way down they hill that they been built in places they shouldn't have been built in. The people had done all the right things – gone through councils and so on and so forth but it hasn't helped them.

One suggestion was that insurance companies could play a stronger role:

> That is probably an angle for insurance companies to look at – they don't want to insure a certain risk because they don't make money out of that. And they could say; 'if you want earthquake insurance with us we will send an inspector around and you will have to do all these things to comply.

> and do that and do that and do that'...So the interesting part of it is that this session here is probably going to motivate me to actually do something about it, because for the first time in a long time I am actually sort of thinking about it and thinking about the consequences of the situation.

If science could predict an exact date

Participants were also asked what they thought they would do if there were an occasion where scientists agreed that a major earthquake would occur in Wellington during a particular month (within a 30-day period). Responses varied. Some argued that even if scientists agreed they would still be sceptical. The extent of the precautions that people might take varied. Some stated that they would decide how inconvenient it might be to take precautions:

> That would depend on when the 30 days were. I would have to take my kids out of school, and my husband would have to be taken out of work for that 30 days. To be practical – it might not happen anyway.

Some suggested that moving might be worse than staying, given that so many people might leave and take their cars.

> I mean you can't shut Wellington down for a month...Everyone would have to either apply for leave or they would have to resign. It is impractical. In some ways staying home and getting really prepared might be safer than going, like to (Turkey) – you would have to leave the country because you might be going somewhere in New Zealand and it might happen there but you wouldn't be as prepared. You would be in some motel somewhere, or a bach, or something. You know your hazards.

> If you are satisfied with your preparations to whatever extent that is. And if you are in a workplace where you are already prepared and you are in a house that you are confident in – then I would probably stay too. I wouldn't stay in my present house.

Some noted that many buildings in Wellington had been strengthened anyway, and that they might want to stay to deal with the effects of the earthquake on their building and property. Many suggested that they would stay in Wellington, but take some precautions, such as avoiding downtown Wellington. There was particular concern expressed about what would happen to downtown Wellington:

> And I just look at downtown Wellington and I think 'holy hell, I just would not want to be here in a decent earthquake.

> I have heard that Lambton Quay is going to be 4 storeys high of broken glass – we were told to take sturdy shoes and leave them under our desks, so that when we are walking home over the 4 stories of glass we don't have our stilettos on.

Others focussed on what they could do, such as developing contingency plans for the family, and making sure the house was as safe as possible. For some they thought they would be fanatical about their preparations.

But some would do more than prepare, and would move out, even if it meant quitting their jobs.

> Yeah – I would probably leave. I would definitely leave the flat. I would consider going on an extended holiday. Securing everything before I left and making sure my family were alright, but then getting out of here.
>
> I would go to Fiji.

But to do this participants suggested that they would need to be sure that the scientists had got it right.

Release of pressure

Spontaneously, a number of participants raised the issue of smaller earthquakes relieving bigger ones. One participant suggested that the public's complacency as regards earthquake preparation was a result of this:

> I just wonder whether the complacency might be borne out of what we hear – that the more smaller ones there are the less likelihood of a big one – that keeps coming through loud and clear – that the smaller ones alleviate the bigger ones.
> *Facilitator* - Where does that come from?
> That comes from the media – it is quite clear in the media – I have heard it on a number of occasions and I have also heard it on the radio as well.
>
> *Participant C* - I think the more that you know about them – not that I know a huge amount about them, but I know enough about them, that is I am interested in them, and the more we have of the little ones the better.
> *Participant D* - It relieves the pressure doesn't it.

Although there were no newspaper articles that mentioned this idea, participants appeared to be getting this idea from other sources.

Summary

The focus groups produced a great deal of information and offered insights into the ways in which people respond to issues of earthquake preparedness. Reactions to earthquakes ranged from the view that people needed to take them in their stride in Wellington to earthquakes engendering a sense of terror and powerlessness. Of note is that during the night earthquakes that the participants experienced none acted to protect themselves, but some acted to protect others. A major concern for some participants experiencing these earthquakes was that the family was together, and not spread out over the city.

The issue of preparation, or lack of it, related to a host of issues. Respondents expressed practical concerns about not being able to prepare, or not having the time or money, or not giving the issue of preparedness priority. The inability to provide precise predictions fostered a lack of a sense of urgency, and people had more immediate concerns to deal with. A blasé attitude could also result from having faith in the building codes on the one hand, to having no faith in the ability of your home to withstand a major earthquake on the other. A number of participants also mentioned an anti-risk approach to the issue, linking concerns about earthquakes to other issues of risk, which were seen as too dominating in their lives if they took them too seriously. A lack of experience of major earthquakes was also seen as a possible reason for why the public do not prepare.

When participants discussed the ways in which people could be motivated to prepare they suggested that family concerns could have a big influence. Schools were seen as a powerful source of motivation, with children putting pressure on parents to prepare. Others mentioned the possibility of neighbourhood groups, particularly to access those older people who did not have children at school or attend work. Participants also suggested that the issue could be presented as one of general emergency preparation, not just earthquakes. Advertising and use of the media was also seen as a good source, with suggestions that advertising could use scare tactics similar to the drink-driving campaigns, and promote simple and achievable outcomes.

In terms of the public distrust of scientists, some participants expressed the view that the over-dramatisation of claims about when a major earthquake will occur may lead to greater distrust. In other words, if you hear a message all the time and nothing happens, then you will not have faith in that message. The media therefore have an important role here in influencing the mistrust of scientists. As the media sensationalises the findings of science, the reputations of scientists becomes tainted. Participants also noted the information gap between science and the public, and some noted that the nature of science is to withhold findings until greater proof has been achieved. There were some that believed that scientists were distrusted by the public as a general response to the commercial influence on science and scientists.

There were a variety of responses about what people would do in the event of scientists being able to develop more precise predictions of earthquakes. Most took a pragmatic approach of better preparation rather than moving out of Wellington.

It should also be noted that the public held views that are not necessarily derived from the media, particularly around the issue of smaller earthquakes relieving the pressure and so helping to prevent a major earthquake.

Conclusions and Recommendations

Scientists, the media and the public

Scientists need to consider ways of taking more control over the media outputs and realise that press releases can be more distorted than other sources of material due to the sub-editing process. The sensational treatment of the earthquake issue can have the effect of undermining the credibility of scientists and may contribute to the widespread view that scientists do not convey all they know to the public. There is an obvious tension here between science and publicity, and the popularisation of science inevitably leads to a simplification and sometimes a distortion of the findings of scientists (Hilgartner, 1990).

On the other hand, the media and scientists should not underestimate the public's ability to understand. Overall the public have a fairly sound knowledge of many issues, and do not have a sense of helplessness about earthquakes.

Preparedness

There is a need to consider ways of making the processes of preparation easier for people. The fire service has started saying that people should change their fire alarm batteries when the clocks change over for summer time. Some similar message could relate to changing emergency water supplies, and perhaps add to that message one simple measure of preparation. Perhaps the change of seasons could be such a date. For example, "1 September is the first day of spring – it is now time to renew your emergency water supplies – and here is one other thing you can do...".

A particularly vulnerable group in terms of lack of preparedness may be older people living alone. This needs to be explored more fully – but this could also be a target group. It would appear that they are less likely to prepare due either to a sense of powerlessness or lack of knowledge and inability. It may be possible to work through local community groups to see if there are ways in which these people could be assisted.

Strategies to encourage preparation may benefit from focussing on the following:

- The public's concern about their families.
- The need to have achievable outcomes.
- The need to have simple messages.
- A goal of providing a sense of control for people.
- Broadening the preparation message to all emergencies where possible, not just earthquakes.

One example of this would be to encourage the development of family plans. This would appeal to people's major concerns about injury to others, it provides some sense of control, and it can be applied to any emergency

situation. Another approach may be to show through media campaigns how others have successfully avoided the worst impact of earthquakes through their preparations for, or responses to, an actual earthquake.

Given the variety of responses in the focus groups it could be suggested that one strategy to get people to prepare would not appeal to all. Those who take an anti-risk position may react against messages highlighting risk. They may respond more to simple solutions. Those who believe that building codes make things safer may need to be appealed to in a different way, with messages that highlight other effects of earthquakes besides structural damage to buildings. In addition, the survey of the public suggests that the 30-50 year olds are more concerned about earthquakes and probably more likely to respond to preparation messages, whereas younger groups may be less likely to respond. There is also a common theme that many people do not prepare for practical reasons. Strategies need to take into account that New Zealanders are not the handy men and women that they might once have been.

Knowledge

Some effort could be put in to raising the public's awareness about the time frame for aftershocks, likely warning times for tsunami, and what could be done to protect Wellington from tsunami. In addition, the view that smaller earthquakes reduces the chances of a bigger one occurring is reasonably prevalent, and may lead to a false sense of security. However, having views that differ from those of scientists, such as belief in the abilities of psychics to predict earthquakes, does not hinder people from making preparations for earthquakes.

Motivation

The work being carried out in schools in developing earthquake evacuation plans and so on appears to be successful in motivating people to prepare for emergencies. Workplace preparations may also have an effect. Other strategies may need to be employed to influence people who do not have children at school.

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Appendix 1 – Questionnaire to scientists

Questionnaire on media reporting of Earthquakes

SOURCE

The questionnaire aims to identify any inaccuracies in the attached article. It also covers articles which quote more than one source. For these, the paragraphs for which you were a source have been marked. Please assess the accuracy of these paragraphs, and also any other parts of the article where you were in fact a source but were not mentioned. Please also answer general questions about material such as headlines.

If you were cited as a source in more than one article, there will be more than one clipping or transcript enclosed. Each clip has its own separate inaccuracy questionnaire attached to it.

FIRST, QUESTIONS ON THE ARTICLE'S ACCURACY

1 Please give your overall assessment of how accurate the article is by circling one of the numbers on the 5-point scale below.

Absolutely accurate	1	2	3	4	5	Extremely inaccurate

2 Do the sections of the article which report you contain any inaccuracies, and if so, where?

no inaccuracies ☐

inaccuracy in headline ☐
subheadings ☐
illustrations ☐
captions to illustrations ☐
first paragraph ☐
remainder of article ☐

3 Please describe briefly any inaccuracies in the headline, subheadings, illustrations or captions:

4 Does the article itself contain inaccurate scientific or technical facts?
(e.g. technical term misused or mis-spelt, incorrect numbers, wrong or over-simplified description of problem, effects or results)

No ☐
Yes ☐

If yes, please specify exactly what is wrong and in which paragraphs:

What changes are needed to correct these inaccuracies?

5 Does the article contain inaccurate non-scientific facts?
(e.g. name of person, position or organization wrong or mis-spelt, numbers such as dollars incorrect, wrong place or time given)

No ☐
Yes ☐

If yes, please specify exactly what is wrong and in which paragraphs:

What changes are needed to correct these inaccuracies?

6 Have your words been: **(Tick one box only)**

quoted accurately ☐
misquoted ☐
quoted out of context ☐
distorted by being paraphrased ☐
distorted by being abbreviated ☐

If not quoted accurately, please specify the problems and in which paragraphs they occurred:

What changes are needed to correct these inaccuracies?

7 Has anything important been omitted? No ☐
Yes ☐

If yes, please specify exactly what is omitted, and where it should be included in the article:

8 Is anything in the article overstated or exaggerated?
(e.g. speculation treated as fact, Incomplete or tentative findings
treated as conclusive, important qualifications on statements omitted)
No ☐
Yes ☐

If yes, please specify exactly what is wrong and in which paragraphs:

What changes are needed to correct these inaccuracies?

9 Is there anything distorted in the overall balance of the article? (e.g. one aspect of research or statements over- or under-emphasised)
No ☐
Yes ☐

If yes, please specify exactly what is distorted and in which paragraphs:

What changes are needed to correct these inaccuracies?

10 What do you think were the reasons any inaccuracies occurred? **(You may tick more than one box)**

the article is too short ☐
the issue is too complex ☐
you did not explain yourself well enough ☐
journalist was in a hurry ☐
journalist was careless ☐
journalist did not understand the issues ☐
journalist lacked scientific background ☐
journalist had preconceived ideas about article ☐
other ☐ (please specify)

11 Do you have any other comments on the published article and its accuracy?

SECONDLY, QUESTIONS ON HOW THIS *ARTICLE CAME* ABOUT

12 Who initiated this article? **(Tick one box only)**

Yourself ☐
press officer in your organization ☐
manager in your organization ☐
journalist who wrote the article ☐
another journalist ☐
don't know ☐
other ☐ (please specify)

13 Did the information you supplied for the article consist of: **(You may tick more than one box)**

your own direct research or investigation ☐
work by colleagues or subordinates ☐
information directly acquired from other parties ☐
general scientific or professional knowledge or consensus ☐
your organization's professional viewpoint ☐
your individual professional viewpoint ☐
your personal opinion ☐
other ☐ (please specify)

14 Was the article based on a press release from your organization? **(Tick one box only)**

No ☐
press release published almost verbatim ☐
press release published with significant editing ☐
press release published with material added ☐

15 What kind of contact did this journalist have with you? **(You may tick more than one box)**

Face-to-face interview ☐
telephone interview ☐
press conference ☐
public address (e.g. conference paper) ☐
used written document you supplied (e.g. report) ☐
no direct contact ☐
other ☐ (please specify)

16 How much time in total did you spend in one-to-one contact with the journalist over this article? **(Tick one box only)**

no time ☐
less than 20 minutes ☐
20 - 60 minutes ☐
more than 60 minutes ☐

17 How well did you feel the journalist understood what you said (please circle one number)?

Understood well	1	2	3	4	5	Understood poorly

18 Did the journalist check the completed article back with you before publication?

No ☐
Yes ☐

19 Does the published article meet the expectations you had when you provided your information?

No ☐
Yes ☐

If no, please specify what your expectations were, and in what ways they have not been met:

20 Did you get feedback from fellow professionals or scientists when this article was published?

No ☐
Yes ☐

If yes, what kind of feedback?

21 How do you feel about the publication of this article?

Very pleased	1	2	3	4	5	Very displeased

Why is this?

FINALLY, SOME GENERAL QUESTIONS

22 What is your interest in or involvement with the issue of earthquakes and their effects?

23 Do you receive many media enquiries?

	On this issue	On any issue
at least one a day	☐	☐
at least one a week	☐	☐
at least one a month	☐	☐
at least one in three months	☐	☐
less than one in three months	☐	☐

24 What is your general assessment of the accuracy of media coverage of earthquakes?

Absolutely accurate	1	2	3	4	5	Extremely inaccurate

25 Please add any further comments you wish to make on the issues raised concerning media or earthquakes:

THANKYOU FOR YOUR ASSISTANCE IN COMPLETING THIS QUESTIONNAIRE!

26 Please indicate whether you would like to receive the summary report of the findings:

No ☐
Yes ☐

Appendix 2 - Questionnaire to public on earthquake knowledge

Phone number ( )…….. Location……..

Date ……/……/…….. Time ……..am/pm case no……

Hello, my name is ---------- from the Department of Sociology and Social Policy at Victoria University of Wellington. I am conducting research funded by the Earthquake Commission on people's ideas about earthquakes. Your number has been randomly selected from the telephone book. Could I please speak to the person in the household who last had a birthday, and who is 16 or over?

If you agree to participate in this research you will go into a draw to win $100. The questionnaire will take about 15 minutes to complete. Participation in this survey is voluntary and you can withdraw at any time, or choose not to answer any questions if you wish. Information from this survey will not be linked to any particular person so you won't be identified in any final report.

Are you willing to participate in this survey?

Do you strongly agree, agree, disagree or strongly disagree with the following statements:

1. Earthquakes are going to cause widespread loss of life and property whether we prepare for them or not.

Strongly agree Agree Don't Know Disagree Strongly disagree

2. If people make preparations for an earthquake, they are almost certain not to work.

Strongly agree Agree Don't Know Disagree Strongly disagree

3. There is nothing people can do about earthquakes, so there is no point in trying to prepare for that kind of emergency.

Strongly agree Agree Don't Know Disagree Strongly disagree

4. The way I look at it, nothing is going to help if there were an earthquake

Strongly agree Agree Don't Know Disagree Strongly disagree

Q5. What best describes your feelings after you have experienced a minor earthquake?

☐ I have not experienced a minor earthquake.

☐ I feel no different.

☐ I feel more worried as a bigger one might be coming.

☐ I feel more worried for some other reason. State_____

☐ I feel less worried as smaller earthquakes may help prevent a bigger one.

☐ I feel less worried for some other reason. State_____

Q6. Have you ever experienced an earthquake where structural damage to buildings or property occurred nearby?

☐ Yes

☐ No

Q7. In your opinion, following a major earthquake aftershocks can occur

☐ Only within minutes

☐ Only within hours

☐ Only within days

☐ Only within months

☐ Within years

Q8. What do you think is the most damage that aftershocks can cause?

☐ More than the original earthquake

☐ As much as the original earthquake

☐ Some damage, but less than the original earthquake

☐ No significant damage

Q9. If you are in Lambton Quay and a major earthquake strikes, where do you think the safest place would be?

☐ On the street

☐ Inside a building

☐ In a lift

☐ In a car park

Other_____

Q10. Following a major earthquake, where do you think the most costly damage would occur

☐ To the structure of your house

☐ To the contents of your home

Q11. If you are told that an earthquake has registered as 7 on the Richter scale would you say this is

☐ A small earthquake

☐ A moderate earthquake

☐ A big earthquake

☐ A major earthquake

Q12. When do you think a damaging earthquake is likely (more than a 50% chance) to occur in Wellington? - that is, an earthquake that might cause damage to chimneys and other minor structural damage.

☐ Within one year

☐ Within ten years

☐ Within fifty years

☐ Within one hundred years

☐ In over one hundred years time

Q13. When do you think a major earthquake is likely (more than a 50% chance) to occur in Wellington? - that is, an earthquake where there would be massive destruction to buildings.

☐ Within one year

☐ Within ten years

☐ Within fifty years

☐ Within one hundred years

☐ In over one hundred years time

Q14. Do you know what a tsunami is?

☐ No ► Go to Q18

☐ Yes

▼

Q15. Could you please describe a tsunami?

_____

Q16. What can be done to protect Wellington from a tsunami?

_____

Q17. How much warning do you think you will get about a tsunami?

_____

Q18. Within the last year have you talked with anyone about the possibility of a big earthquake happening in Wellington?

☐ No ► Go to Q20.

☐ Yes

▼

Q19. With whom did you talk to about the possibility of a big earthquake happening in Wellington (e.g. parent, brother, neighbour, workmate etc)? List as many as you can recall.

_____ _____ _____

_____ _____ _____

_____ _____ _____

Q20. What sorts of things could you do to prepare for a major earthquake? List as many as you can.

_____
_____
_____
_____

Q21. What have you done to prepare for a major earthquake? List as many things as you can.

_____
_____
_____
_____

☐ Nothing

Q22. Do you know of anyone else who has taken action to prepare for earthquakes?

☐ No ► Go to Q25.

☐ Yes

▼

Q23. Who were those people? Please list (e.g. parent, brother, workmate etc).

_____

Q24. What have they done to prepare for an earthquake?

_____
_____
_____
_____

Q25. In your opinion, which of the following best describes the ability of scientists to precisely predict earthquakes? (that is, the location and magnitude)

☐ No ability

☐ Low ability

☐ Some ability

☐ High ability

Q26. Do you think that scientists tell the public all they can about their predictions of earthquakes?

☐ Yes ► Go to Q28.

☐ No

▼

Q27. Why do you think they are not giving out all available information?

_____
_____

Q28. Is there anyone else that may be able to predict a major earthquake?

☐ No ► Go to Q30.

☐ Yes

▼

Q29. Who do you think may be able to?

_____

_____

Q30. Do you think there are any signs of when an earthquake is coming?

☐ No ► Go to Q32.

☐ Yes

▼

Q31. Please list signs that you think mean an earthquake is coming.

_____

_____

Q32. The following are possible effects of earthquakes. Could you rate each of them on a scale of 1-10, where 1 is the least worrying to you and 10 is the most worrying to you.

Building damage	___
Fire	___
Landslips	___
Flooding	___
Civil unrest	___
Lack of water	___
Power cuts	___
Gas leaks	___
Injury to you	___
Injury to others	___

Q33. In the last year have you learnt about earthquakes from the following sources? (tick all that apply)

☐ Television

☐ Radio

☐ Newspapers

☐ Mail Pamphlets

☐ The InterNet

☐ Your Workplace

Other _____

Q34. On a scale of 1-5, where 1 is absolutely accurate and 5 is extremely inaccurate, what is your assessment of the media coverage of earthquakes?

Absolutely accurate	1	2	3	4	5	Extremely inaccurate

☐ Don't know

Q35. What would be the best way for you to find out about preparing for earthquakes?

☐ Television

☐ Radio

☐ Newspapers

☐ Mail Pamphlets

☐ The InterNet

☐ Your Workplace

Other _____

Q36. In the last year have you tried to find out more information about preparing for an earthquake?

☐ No ► Go to Q38.

☐ Yes

▼

Q37. What did you do?

_____

Finally, some information about you. If you don't want to answer any question you don't have to.

Q38. Are you

☐ Female

☐ Male

Q39. In what age bracket do you come?

☐ 16-30

☐ 30-50

☐ 50 or over

Q40. Are you currently

☐ Married

☐ Living as Married

☐ Separated/Divorced

☐ Widowed

☐ Not married

Q41. Which ethnic grouping do you identify with?

☐ New Zealand European/Pakeha

☐ New Zealand Maori

☐ Pacific Nation

☐ Chinese

☐ Indian

☐ Other: Please State _____

Q42. Which of the following best describes your status?

☐ Home owner

☐ Tenant paying rent

☐ Tenant not paying rent

☐ Boarder

☐ Other: Please State _____

The following location information is for coding purposes only, it enables us to link your address with hazard information and economic information about your area. Once these have been coded your address will be deleted from this questionnaire.

Q43. What suburb do you live in? _____
Q44. Name of your street _____
Q45. House number _____

Q46. Which of the following is your highest educational qualification?

☐ None

☐ School Certificate

☐ University Entrance

☐ Seventh Form Certificate

☐ Trade certificate

☐ Diploma in teaching.

☐ University degree

☐ Other tertiary qualification

Q47. What was your income for the last calendar year (1998)?

☐ Less than 20,000 dollars

☐ Between 20,000 and 50,000 dollars

☐ Over 50,000 dollars

Q48. How long have you been living in the greater Wellington area?

☐ Less than 1 year

☐ Between 1 and 5 years

☐ Between 5 and 20 years

☐ Over 20 years

Finally - in order for you to go into the draw we will need to have your name and a contact phone number. This will be kept separately from the data collected.

Name _____

Phone _____

We will also be arranging some focus groups where we get a few people together to discuss some of the issues raised in the survey. Times will be arranged to suit potential participants, and you will go into another draw for $100. Would you be willing to participate in a focus group?

☐ No.

☐ Yes

Name_____

Phone_____

Thank you for participating in this research. If for any reason you would like to ask me any questions about this research you can contact me, Kevin Dew, on

463-5233 ext. 8785

Appendix 3 – Focus Group Topics

1. What did you do when the earthquakes struck Wellington a couple of weeks ago? e

2. The survey of the public found variable knowledge about what could be done to prepare for earthquakes.

What could be done to increase our knowledge?
What would you like to have scientists give you in terms of information?
Does the fact you might know that your bookshelf should be secured lead you to actually secure it?

If not – why not?

What could be done to change this?

3. Our survey of the public shows that 50% of you felt that scientists know more than they are letting on.

Do you therefore think that the situation about the possibility of a major earthquake is greater than we are being told? Or less than we are being told?

Why do you think that this is the case?

How does this make you feel?

Scientists rated media overall at 2.67

Public rated media overall at 2.63

What do you think of this?
Why do you think the public is negative?

Scientists feel that journalists tend to overdramatise – make things sound worse or more dramatic than they are.
But the public think scientists don't tell all? What is going on here?

5. If scientists claimed that they were now able to predict earthquakes with a high degree of accuracy (e.g. there will be a major earthquake some time in this thirty-day period) – what would you do if such a prediction were given out?