

Self-Management of Disaster Risk and Uncertainty: Evaluating a Preventive Health Approach for Building Resistance to Disaster

Report to the Earthquake Commission

By

**Monica E. Gowan^{1, 2}, David M. Johnston²,
Ray C. Kirk¹ and Kevin R. Ronan³**



Massey University



**Central Queensland
UNIVERSITY**

Research Report 2009/01

June 2009

- 1. Health Sciences Centre, University of Canterbury**
- 2. Joint Centre for Disaster Research, Massey University/GNS Science**
- 3. School of Psychology and Sociology, Central Queensland University**

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Executive Summary

This report presents preliminary findings from an investigation into the relationship between health and well-being and evacuation preparedness for earthquake and tsunami in Wellington, New Zealand.

The overall research aims were to: 1) conduct descriptive, exploratory research into the incidence and distribution of primary health-predictive variables and behavioural outcome variables, and 2) conduct analytical, explanatory research into the relationships between these variables. The predictive variables, represented by proxies for strong coping attitudes and autonomous motivation (attitudinal and behavioural self-management skills), were selected for examination of whether they showed a strong and positive association with preparedness actions that reduce the occurrence of mental health trauma and build resilience to stress in the general population.

We designed a quantitative baseline epidemiological survey to address these principal research questions and to also collect background information on general hazard awareness, risk perception, disaster experience, and other environmental correlates. The survey was distributed to 2451 households in a sample of the eastern suburbs of Wellington, and we had a response rate of nearly 30%. Data processing is underway and analyses will continue through the first quarter of 2010, as per the project duration. Preliminary results are not generalisable until the complete data set is processed, but we note with interest that our study population includes many disaster survivors and a sizeable number are concerned that an earthquake will require evacuation from the Wellington region.

Our study approach has been a subject of keen interest and well-received following conference presentations and research discussions at institutions around the world, leading to sustained curiosity in the research subject and a desire to build and maintain collaborative research relationships. We gratefully acknowledge the support of the New Zealand Earthquake Commission in the conduct of this research.

1.0 Introduction

This study quantitatively measures and analyses the association between health-predictive attitudes and disaster evacuation-preparedness behaviours in members of the Wellington general adult population. Set in the hazard context of earthquakes and tsunamis, it is based on the foundational premises of preventive medicine and public health: 1) that the way an individual responds to the prospect of a health threat influences health outcome, which provides an opportunity for negative health outcomes to be minimised or prevented before any type of disaster strikes; and 2) that by measuring and assessing the baseline health status and needs of a population, health interventions can be more effectively designed to promote positive behaviour change and to increase healthy outcomes.

2.0 Project Objectives

Our specific interest in making a contribution toward both reducing the occurrence of disaster mental health trauma and building stress resilience in the general population led us to focus our field investigation on the baseline *incidence and distribution* of select psychosocial variables that can influence mental health outcomes, and on the *level of engagement* in preparedness behaviours that can enhance self-management and adaptive capacity.

At the time of EQC grant submission and approval, our study plan called for focusing the theoretical basis of the research on the relationship between one primary predictive variable, Sense of Coherence (Antonovsky 1987, 1993, 1996) and evacuation preparedness behaviour, along with an assessment of overall health status. However, during the development of our quantitative survey instrument it became increasingly clear that our data set could be well-complemented and significantly enhanced by including key correlates (e.g., motivation, social support, other facets of well-being). We also realised that by conceptually linking this survey with the type of social-cognitive questions used in previous EQC-funded preparedness surveys, there could be long-range opportunities to enhance the utility of all these data sets through meta-analysis.

To reflect this significant evolution in the depth, breadth and relevance of our investigation, we developed a multi-dimensional baseline epidemiological survey (informally known as the “Wellington Disaster Prevention Study”), designed to yield a population-level community data set on individual attitudes and behaviours, and address the three principle psychosocial domains of thinking, feeling, and doing:

1) Cognitive Domain: we measure the respondent’s perception of the potential for earthquake- and tsunami-triggered disaster in Wellington and how they believe they could be affected, their general awareness of their hazard and risk exposure, and their prior experience with disaster;

2) Affective Domain: we measure how the respondent approaches day-to-day life (including Sense of Coherence), their general health and well-being, and their attitudes toward, and motivations for, preparing and coping with evacuation; and

3) Behavioural Domain: we measure the type and level of evacuation preparedness activity the respondent is engaged in.

We included standard demographic questions to establish general trends for representative and comparative purposes. Table 1 contains a table summarising the main types of proxy variables selected for each domain, with full citations for the validated psychosocial instruments and health measures contained in the references section of this report.

This important shift to characterising a suite of variables triggered two other modifications in the overall PhD project agenda. Firstly, considering the opportunity before us to create a rich and value-added data set, and the availability of supplemental funds through Foundation for Research, Science and Technology (FRST), we decided to at least double the distribution of our survey instrument from 1000 to 2000+ households, thereby increasing the potential return rate and generalisability of the results. Secondly, we concluded that the fundamental priority for the PhD stage of the project could likely become our original “Phase I”, the administration, data processing, statistical analysis and reporting of the survey results. Whilst testing a pilot intervention evaluating the framing effects of a health promotion message on preparedness action (our original “Phase II”) remains of deep interest, the

Table 1. Principal Research Domains and Instruments

Psychosocial Research Domain	Construct or Proxy Variable	Validated Instrument Name (if applicable)	References¹
Cognitive Domain (Survey Section 1)	Perceptions of Hazard, Vulnerability, Risk Personal Disaster Experience	Survey-specific questions	JCDR survey files; self-authored questions
Affective Domain (Survey Sections 2 & 3)	Social Support	Friends Scale	Hawthorne, 2006
	Motivation	Self-Determination Scale	Deci and Ryan, 1985
		Health-Related Treatment Self-Regulation Scale	Williams et. al., 1996
	Orientation to Life	Sense of Coherence Scale	Antonovsky, 1987, 1993, 1996
	Subjective Health and Well-Being	Serenity Scale	Boyd-Wilson, Walkey, and McClure, 2006
		Short Form Health Survey (SF-12) Satisfaction with Life Scale	Ware et. al., 1996 Diener, Emmons, Larsen, and Griffin, 1985
Behavioural Domain (Survey Section 4)	Evacuation Preparedness	Survey-specific questions, in format of Transtheoretical Model (Stages of Change)	JCDR survey files; self-authored questions; Prochaska et. al., 1987

¹ See References Section at end of this report for full citations

expansion and migration of our quantitative survey into a much more comprehensive baseline investigation adds substantial weight to the importance of our data set and to gaining a sound analytical interpretation from it. Understanding the characteristics of a study population and the emergent community needs are prerequisites for intervention design; we look forward to our extensive and critical analyses providing a valuable source of targeted information and effective guidance at the appropriate stage.

3.0 Sampling Methods and Procedures

While studying the hazards and riskscape of Wellington, the eastern suburbs emerged as the preferred sampling area for this study. We viewed the combined exposure to earthquake, tsunami, liquefaction, landslide and fire hazards, and the likely post-disaster geographic isolation and lifeline vulnerabilities, as factors that increase the potential for community evacuation and heighten the risk of prolonged displacement, conceivably above other areas in Wellington. We drew our study population from six suburbs (Oriental Bay, Roseneath, Hataitai, Lyall Bay, Miramar North, and Seatoun), selected to ensure representation of the variable geographic, geologic and socio-economic conditions in the eastern suburbs, while keeping within the inherent limitations in budget and analytical scope of a PhD project.

The sampling frame was defined as all households in these six suburbs. We randomly collected our sample by visiting all streets within each suburb (as defined by the boundaries of Statistics New Zealand mesh blocks), and recording the street address for every 2nd to 3rd household, yielding a total sample of 2451 households.

Following pre-testing for reliability and validity by peer review, and pilot testing on a small sample from the general population with similar demographic characteristics to the study population, the study questionnaire was posted with a Freepost reply envelope to the letterboxes of these households. An information sheet and cover letter were included to engage respondents and to address all requirements of our ethics notifications. To randomise within the household, we suggested in the cover letter that the

person who completed the questionnaire be the adult (age 18 or over) who most recently had a birthday.

Concurrent with the first round of survey administration, we distributed a press release to Wellington media outlets to raise public awareness about postal delivery of the questionnaire. We conducted 3 radio interviews, including one aired on a Radio New Zealand national news programme ("Checkpoint"). The weekly newspaper, The Wellingtonian, also ran an article. We then administered a second posting of the survey to non-responding households approximately 4 weeks after the first survey administration.

A copy of the questionnaire with information sheet, cover letter, follow-up letter, and news article are provided in Appendix 1.

4.0 Data Processing and Preliminary Results

Approximately 700 people returned completed surveys; this represents a response rate of ~ 29% (final numbers to be determined after data processing is complete). Data entry and cleaning is almost half completed and is anticipated to be concluded by this September.

Descriptive statistics and correlations on the strengths of relationships await the fully-processed data set, as do calculations of ratings from the validated psychometric scales, but initial frequency distributions show some interesting early trends. A few highlights from preliminary analyses:

- Respondent age is greatest and distributed equally (35%) in the ranges of 25-44 years and 45-64 years, 25% in the 65 years and over range, and lowest (5%) in the 18-24 years range. Females comprise 64% of respondents. New Zealand European is the dominant ethnicity (84%), with others describing themselves as Asian (3%), Maori (2%), Pacific Peoples (2%), or other (9%).
- The most common educational level obtained is University undergraduate degree (35%), followed by trade certificate or other diploma (28%), postgraduate degree (16%), high school qualifications (16%), and no school qualifications (5%).

- Respondents are largely without dependent children (70%) and own their homes (73%).
- Eighty-seven percent (87%) have a regular GP that they see on at least an annual basis. Self-reported general health status is rated as excellent (24%), very good (40%), good (25%), fair (9%), or poor (2%).
- Decidedly unlike disaster researchers, respondents report that they think only a few times a year about an earthquake (52%) or tsunami (58%) occurring in Wellington, and few think about these events on a daily basis (3% for earthquake; 2% for tsunami). Yet the majority identify earthquake (98%) and tsunami (51%) as the two most likely hazards to trigger a disaster in Wellington, followed by landslide (40%) and pandemic flu (11%). Also, a sizeable proportion rate the likelihood that an earthquake or tsunami could affect them personally as very high (“very likely”) via property damage (46%) and adverse impacts to their health and safety (30%).
- Respondents rated their evacuation preparedness as very well prepared (5%), well-prepared (17%), somewhat prepared (44%), poorly prepared (23%), and not at all prepared (10%).
- Close to 1 in 5 respondents (17%) have assembled and placed a “getaway kit” in an easily accessible spot, ready for evacuation, but a similar percentage (18%) have not contemplated doing so. Others are in various stages of contemplation (25%), intention to take action (23%), or early action (13%). Over 50% are concerned that an earthquake will require evacuation from the Wellington Region, and 35% share a similar concern for tsunami.
- While only 13% have experienced a disaster triggered by earthquake, 20% have experienced disasters of other types and 25% have witnessed the impacts of disaster on someone they knew. Personal experiences run the gamut, from surviving World War II bombings, concentration camps, a military coup in Kenya, terrorism in Sri Lanka, 9/11 in New York City and Washington, D.C., family murder, and domestic violence; Australian bushfires, the

1968 Wahine Storm, earthquakes in New Zealand, Japan, the United States, and Mexico; typhoons and hurricanes, cyclones and floods, house fires, landslips, tornado, volcanic eruption; to workplace accidental fatality, the polio epidemic, SARS, and working with traumatised survivors of war and the 2004 South Asian Tsunami.

5.0 Related Research Activities

Support from the Earthquake Commission was crucial for the costs associated with production and administration of the survey instrument. Travel assistance also allowed us to receive widespread exposure for New Zealand disaster research at international conferences² in 2008 and foster opportunities for future research collaborations. We presented on the foundational theory and methodology of this project at four conferences around the world in 2008:

- In late July we presented a poster at the 2nd Australasian Natural Hazards Management Conference, held at Te Papa, Wellington.
- In early August, Ms. Gowan delivered an oral presentation at the International Geological Congress in Oslo, Norway, in a session on “Geo-Risk in the 21st Century”, one of the conferences’ “Themes of the Day”.
- In late August, Ms. Gowan delivered an oral presentation at the International Association of Volcanology and Geochemistry of the Earth’s Interior General Assembly in Reykjavik, Iceland, as part of an interdisciplinary symposium on responding to health hazards.
- In October, Ms. Gowan presented a poster (as above) in a session on education and community outreach at the Geological Society of America Annual Conference in Houston, Texas, USA.

² EQC funds supported the cost of international air travel. Other conference costs were met through competitive awards from the University of Canterbury Health Sciences Centre Margaret Scott Award and the University of Canterbury College of Education PhD Conference Grant Programme. The Geological Society of America also provided domestic travel support for the GSA Houston conference during Ms. Gowan’s research period at Mayo Clinic College of Medicine.

All four presentations provided excellent opportunities for further review and comment on the quantitative survey with numerous researchers in attendance from all over the world. Published abstracts and a copy of the poster are provided in Appendix 2.

During this conference period, we were also able to meet with key researchers and organisations to receive critical mentorship and guidance on our research investigation. Locally, Ms. Gowan benefited from external project guidance and mentorship from Dr. John McClure, School of Psychology, Victoria University of Wellington. While overseas, Ms. Gowan participated in a one-on-one research meeting and teleconference discussions in Sweden and Finland with eminent scholars Dr. Monica Eriksson and Dr. Bengt Lindstrom from the Folkhalsan Research Institute Health Promotion Programme. They shared findings from a systematic review of salutogenesis research using the Sense of Coherence (SOC) scale, provided guidance on the theoretical basis and reliability of an abbreviated 13-item SOC scale (which we ultimately used in place of the 29-item SOC scale), and reviewed our draft survey. Ms. Gowan also spent 20 research days at Mayo Clinic College of Medicine³ in Rochester, Minnesota, USA, where she met with external mentors who specialise in epidemiological research, survey design, biostatistics, quality of life studies, behavioural intervention design, and health-based decision-making. We were able to discuss final survey revisions, strategies for limiting non-response bias, approaches to coding survey questions, and development of our statistical analytical plan.

In addition to these presentations and research meetings, Ms. Gowan actively participated in other study-relevant activities in Christchurch and Wellington, strengthening collaborative and institutional ties within New Zealand:

- In May 2008, she gave a talk on her PhD project at a University of Canterbury Natural Hazards Research Seminar.

³ Ms. Gowan holds a Research Collaborator appointment at Mayo Clinic College of Medicine in the Department of Health Sciences Research. She is mentored by Drs. Tim Beebe (Survey Research Center), Jeff Sloan (Division of Biostatistics), Kristin Vickers Douglas (Department of Psychology and Psychiatry), Victor Montori (Knowledge-Encounter Research Unit), and Jennifer St. Sauver (Division of Epidemiology).

- In November 2008, she was an invited observer for 2 days at the Greater Wellington Regional Council's "Operation Phoenix V", a disaster exercise testing the response capabilities of emergency management authorities in a Wellington Fault earthquake scenario. This opportunity provided excellent insight into the structure of New Zealand emergency management and the likely needs for the Wellington community after an earthquake.
- Also in November, she also attended the Geological Society of New Zealand's Annual Meeting and special symposium on "Bridging the Strait: Active Geological Processes and Natural Hazards in Central NZ", where researchers presented the latest evidence on seismic hazards and earthquake risk in the Wellington region.
- In December 2008 she presented an overview of her survey instrument development process at "Disastrous Doctorates!", a day-long event highlighting PhD projects associated with the GNS Science/Massey University Joint Centre for Disaster Research.
- In February 2009 she attended several workshops at the JCDR Emergency Management Summer Institute and gained further perspective on Wellington disaster potential from a day-long field trip to high risk zones, including localities in her field area.
- In May 2009, at Dr. Johnston's invitation, she began participating in meetings of the Disaster Health Research Network, a Massey/GNS Science Joint Centre for Disaster Research initiative.

6.0 Anticipated Project Outcomes

6.1 Project Findings

As data processing and analyses continue, the principal focus will be on fulfilment of the approved PhD proposal's exploratory and analytical research aims. Namely, this will be to explore and measure the presence (incidence and distribution) of the primary affective predictors and evacuation

preparedness behaviours; to assess health status; and to determine the association of these predictors with health status and preparedness level.

Based on the positive trend of high respondent willingness to complete affective scales for Sense of Coherence (Antonovsky, 1987, 1993, 1996) and internal and health-related motivation (Deci and Ryan, 1985; Williams et. al., 1996), as well as general health status (Ware, et. al., 1996), we believe we will have robust results on the relationship of these variables with preparedness behaviours. We also anticipate a strong sense of the level of social support (Hawthorne, 2006) and coping resources available to respondents. Subjective well-being and quality-of-life (Diener, et. al., 1985; Boyd-Wilson, et. al., 2006) are currently presenting somewhat less reliable results for interpreting their role as predictors in preparedness behaviour, but the final conclusion on that must await analysis of the full data set.

Questions on cognitive perceptions of hazard, vulnerability, and risk are yielding very interesting answers and will provide some guidance for earth science-based educational and outreach messaging, but are secondary to the central purpose of this investigation. Perhaps most intriguing are the responses to open-ended questions of disaster experience. The willingness of some respondents to share their deeply personal (and at times deeply moving) life history is a generous and appreciated contribution; compilation of these answers will provide insightful anecdotal perspective from the community.

6.2 Advances and Opportunities

Our findings are yielding a valuable cross-sectional representation of Wellingtonian attitudes and behaviours on evacuation preparedness – an important “snapshot in time” of community perceptions, strengths, and the will to take action. These comprehensive findings are also building a solid foundation for future studies. They will be useful for analyses and interpretation well beyond the scope of the PhD, and for establishing a baseline for any future longitudinal studies.

We also foresee that our results can significantly contribute to policy, practice and public education in both the emergency management and health

sectors. One example is that in both fields of practice, much of the preparedness work has concentrated (importantly) on cultivating a culture of hazard awareness, improving physical measures of preparedness (e.g, storing food, water, torches, blankets), and developing post-disaster capacity in clinical and hospital settings for responding to all forms of trauma. At this early stage, the items our respondents are self-reporting as most critical for their preparedness (food, water, medications, first aid kits, etc.) reflect that this physical preparedness message seems to be getting through. And without question, these items are imperative for increasing odds of “shelter-in-place” survival in the first few days of a disaster. The intense focus on these needs, however, may point to an oversight of the criticality of self-management beyond a 72-hour survival period and being prepared for evacuation to a welfare centre or elsewhere. Dislocation, re-establishing identity, dealing with documentation requirements to access resources, attempting to reconnect with social support, and maintaining some sort of continuity with one’s life history are challenges that food and water alone cannot overcome. One respondent commented on this point directly:

“Difference between having a box of food & water etc and a “getaway” kit - don’t think about evacuation at all - just having equipment if there is a disaster. I have no idea what to do in the event of a tsunami and earthquake as this seems to be the emphasis.”

The tasks of evacuation planning are therefore emerging as a possible weak link in community perceptions of what “preparedness” means. These activities are important not only for immediate self-management of overall health and well-being, but also for managing expectations during the potentially long-term process of adapting to profound changes in life circumstances.

Our interaction with the study population is helping to address this gap, and not only from a theoretical perspective. Several respondents reported on their surveys that we are raising issues they had not previously contemplated or prepared for, and that the activity of completing the survey has motivated them to broaden the purpose and nature of their preparedness efforts, and to

heighten it as a priority. For them, the study has acted as an intervention, simply by participating in it.

From the standpoint of professional interactions, we remain actively engaged in the disaster research community and in events that will bring together diverse fields of research and practise on the subject of disaster resilience. We will be in leadership roles and presenting our research findings at two events on the near horizon (see Appendix 3 for supporting details):

- The 2009 New Zealand Psychological Society Annual Conference will convene this August in Palmerston North.
 - Dr. Johnston is chairing a symposium on Psychology and Disasters. Ms. Gowan co-authored an accepted oral abstract for this session with another JCDR PhD student, Debra Ellis, on the applications of salutogenesis theory in disaster contexts as a construct and measure of health and well-being.
- The 2009 Annual Conference of the Geological Society of America, a global professional society with membership of more than 22,000 in 97 countries, will take place in October 2009 and is expected to draw 6000-7000 attendees from all over the world to Portland, Oregon, USA. The theme of this conference is on adapting to and managing the risks of living with natural hazards. The geographic setting and riskscape of the US-Canadian Pacific Northwest and the host city is quite similar to New Zealand (high risk of earthquake, tsunami, landslides, and volcanic impacts with dense population centres depending on vulnerable lifelines and infrastructure). The Geological Society of New Zealand (GSNZ), the International Association of Emergency Managers (IAEM), and the International Medical Geology Association (IMGA) recently became Associated Societies of GSA and are expected to have a strong presence at the conference. We will present our research at this meeting and anticipate our findings will be of great interest and significance to the audience, both from the standpoint of addressing similar issues and as an opportunity to share the Australasian approach to disaster research and management.

- Ms. Gowan is co-convenor of Topical Session 134, “Risks and Realities: Current Advances in Understanding Societal Risk and Resilience to Natural Hazards”. We will submit an oral abstract on the methodology and results from this project to this session.
- Ms. Gowan also is lead convener of Keynote Symposium P7, “Hazards and Health: Preventing Disaster and Building Resilience on the Ring of Fire”. She arranged for intellectual co-sponsorship of this symposium from GSNZ, IAEM, IMGA, as well as the IUGS (International Union of Geological Sciences), INQUA (International Union for Quaternary Research), and the USGS (US Geological Survey).
- Dr. Johnston is a co-convenor and invited speaker for the Hazards and Health Symposium and will be submitting an abstract for this event.

7.0 Acknowledgments

We look forward to on-going communications with the Earthquake Commission on these endeavours and to future interactions to advance the state of disaster preparedness and emergency management in New Zealand. The funding of this project by the New Zealand Earthquake Commission (EQC) is gratefully acknowledged.

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