

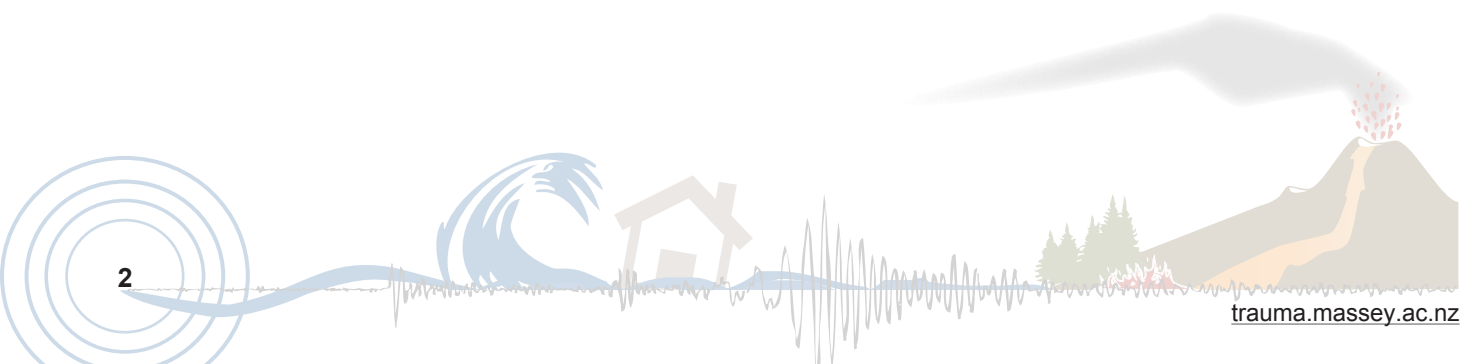


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# Earthquake Risk Perception among Citizens in Kathmandu, Nepal

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## Abstract

*Preparedness plays a very significant role in creating the seismic safety and thereby contributes to move forward to the path of peace, progress and prosperity. It is equally important for a nation like Nepal which is situated in the highly earthquake prone geographical location. Kathmandu valley, which is the capital of the country and the main hub for trade, commerce, education and administration, is considered as one of the earthquake prone areas. It is a highly populated area with an estimated population of about 2 million. The people and the development are concentrated in the three cities of the valley namely Kathmandu, Bhaktapur and Lalitpur. Any future large earthquake is likely to cause serious effect to its citizens if the country fails to make adequate preparedness in advance*

*The present study tries to determine the linkage between the earthquake preparedness and other parameters in the urban parts of the Kathmandu valley using the household survey data collected from 430 respondents. The result shows that the variables such as experience of an earthquake and concern for the future damage significantly influenced the preparedness among the respondents in the study area.*

**Keywords:** Disaster, Earthquake Awareness, Preparedness

## Introduction

The Himalayas is one of the youngest and active mountain ranges in the world. It ranges from Afghanistan in the west to Myanmar in the east. The constant pushing of Indian plate towards the Eurasian plate has made the region seismically active. Earthquakes in the Indian subcontinent have been recorded even in ancient Sanskrit texts (Bilham 2005). Lying between India and China, Nepal is a landlocked mountainous country with an area of 147,181 square kilometer (Figure 1). The capital of Nepal is Kathmandu which lies in the valley. Nepal has been regularly hit by earthquakes and this has been recorded in olden colophon and written history (UNDP 1994).

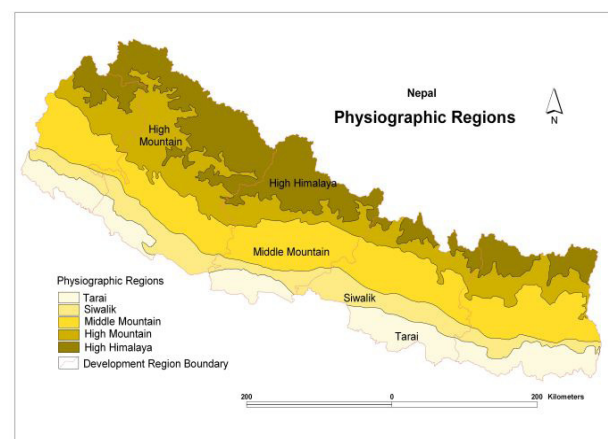
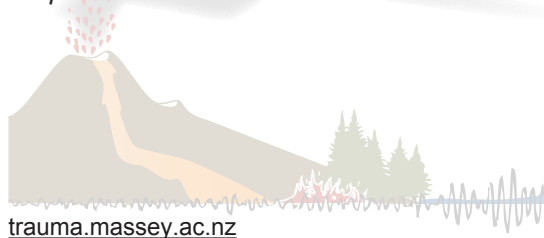


Figure 1. Map of Nepal

The major historical earthquakes recorded in Kathmandu valley include 1255, 1408, 1681, 1810, 1833, 1866, and 1934 A.D. During the 1255 earthquake, one-third of people including reigning King Abhaya Malla died. Many palaces, temples and dwellings were badly damaged. It is said that aftershocks continued for three years (Bilham 1995). The 1934 earthquake, magnitude of 8.4 in Richter scale with an epicenter some 10 kilometers south of Mt. Everest, claimed 16,875 lives and destroyed 3,18,139 houses. Kathmandu valley was severely affected with 4,296 deaths and 55,793 houses damaged. Many heritage monuments were damaged or destroyed during the earthquake. Similarly, the 1988 Udayapur earthquake in the Eastern Nepal claimed 721 lives and damaged property worth millions of rupees. Its effect was also felt in the valley, with the death of eight people and damage to many buildings



The analysis of historical data suggests that a great earthquake in the Himalayan region generally occurs in an interval of 80 to 100 years. The 1934 earthquake is the largest disaster event in terms of death toll and property loss (serious damages to 60% of the buildings in the Kathmandu Valley) in 20th century (JICA 2002 and EM DAT 2007). Since seismologists are predicting a severe earthquake in the near future, it is a matter of great concern. Given that earthquakes are inevitable for the Kathmandu valley, there is a need of finding ways to cope with it. Advanced preparedness for an earthquake can be undertaken to reduce the risk and possible harm.

Kathmandu valley, with an area of 667 km<sup>2</sup> and population of about 2 million, is the exclusive center of politics, economy, education and administration of Nepal. Three cities in valley viz., Kathmandu, Bhaktapur and Patan were old city-states and presently they house world heritage sites in the city cores. Due to increased population, poor subsoil condition and haphazard development, seismic vulnerability of the valley has been increasing. If a major earthquake occurs similar to that of the 1934 (magnitude 8.4 Richter scale), the situation is likely be very catastrophic. An estimate by National Society of Earthquake Technology (NSET) has predicted about 40,000 deaths with a hundreds of thousands people rendering homeless if earthquake similar to the 1934 Nepal earthquake occurs in the Kathmandu valley (NSET 1998). This will severely imperil the ability of the nation to operate effectively following the disaster. The development of not only Kathmandu valley itself but the whole nation will be regressed.

In the valley there are mostly brick built houses on the plains and stone buildings on the mountainous region. Japan International Cooperation Agency (JICA) has classified the buildings of valley into adobe, stone, brick in mud, brick in cement, reinforced concrete frame and others (that include buildings like stone and adobe). The greatest stock is building in reinforced concrete frame (23%) followed by brick in cement (21%). Stone buildings make up the lowest percentage of buildings by 7%. Two building construction systems, namely private and public building, are dominant. In the private building system, construction is mostly carried out by the owner and less often by the contractors and housing companies. Most of the buildings in the cities were built before the application of the building codes was enforced by the state. It is to be noted that only after 2005 A.D. building code is made mandatory for the

new buildings. The situations described above have added increased vulnerability to building stocks and their occupants. Buildings are also deteriorating due to old age and lack of maintenance. These issues have added increased vulnerability to building stocks and their occupants.

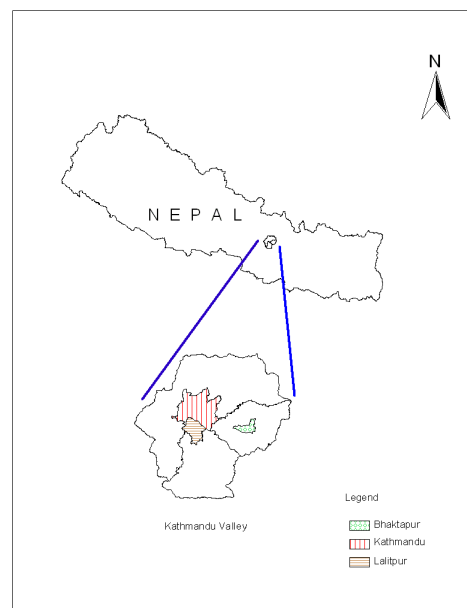
Earthquake preparedness is essential to achieve sustainable development of valley and of Nepal as a whole (JICA, 2002). The impacts of natural hazards such as earthquakes can be reduced if people adopt pre impact hazard adjustments (Burton et al 1993). The purpose of our research is to inquire into the state of awareness and level of preparedness in the communities located in the Kathmandu valley as well as finding out ways for awareness-raising on the seismic safety.

## Materials and Methods

### Selection of the study area

The study was conducted between September 2007 and April 2008, in both old and newly settled areas of Kathmandu valley to represent the diverse urban context.

Figure 2. Katmandu Valley and its main cities



City cores were selected near historical monuments. Surveys were carried out in three cities of Kathmandu valley (see Figure 2) covering four areas, namely, Yatkha, Shantinagar, Bhaktapur and Patan. Yatkha, Bhaktapur and Patan which represent city cores of Kathmandu, Lalitpur and Bhaktapur respectively, where

as, Shantinagar represents the newly settled area in the Kathmandu city. The city cores are the old areas where traditional planning methods created by the Malla rulers (1201-1769) were used where as, in Shantinagar, which is recently developed area without following any urban planning guidelines. During the Malla ruling period, Kathmandu, Bhaktapur and Patan were independent city-states. As in the past, most of the inhabitants in the city cores belong to indigenous Newar community. Inhabitants of the area are of mixed races that have migrated from different parts of country mostly from the 1970s onwards.

**Sampling and data collection**

A questionnaire was used to conduct face-to-face interviews. Initially, it was planned to be 100 respondents in each location but at the end of the survey, the total respondents turned out to be 430 households which was just an accident. The sample distribution was 100 each in Lalitpur and Bhaktapur, 112 in Yatkha and 118 in Shantinagar. Data were collected from as many respondents as possible because of rather short research period. The survey intends to gather information regarding risk perception and preparedness against the earthquake. Table 1 shows questions that were asked during the interview. Since the questions were in English, in most of the cases translation into Nepali was necessary to assist the interviewees to understand the questions. After the field survey, a descriptive analysis was prepared and statistical analysis was undertaken to find out the relationship between the level of knowledge on earthquake, concern to future earthquake damage and earthquake preparedness.

**Table 1.** Questionnaire form

Experience of earthquake	Yes	No
Concern about earthquake damage	Yes	No
Level of preparedness	Yes	No

**Hypothesis and statistical analysis**

Following hypotheses were tested to find risk perception among Kathmandu citizens.

Case 1

H<sub>0</sub>= Experience of earthquake and damage concern are independent events.

H<sub>1</sub>= Experience of earthquake and damage concern are not independent events.

Case 2

H<sub>0</sub>= Damage concern and preparedness are independent events.

H<sub>1</sub>= Damage concern and preparedness are not independent events.

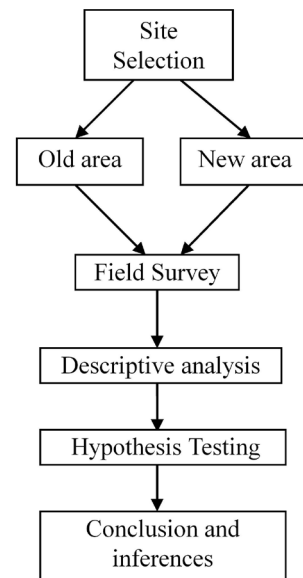
Case 3

H<sub>0</sub>= Earthquake experience and earthquake and preparedness are independent events.

H<sub>1</sub>= Earthquake experience and earthquake and preparedness are not independent events.

Descriptive analysis was done for the response analysis while Chi square test was done for hypothesis testing. Figure 3 clearly shows the flow chart of methodology adopted in the study.

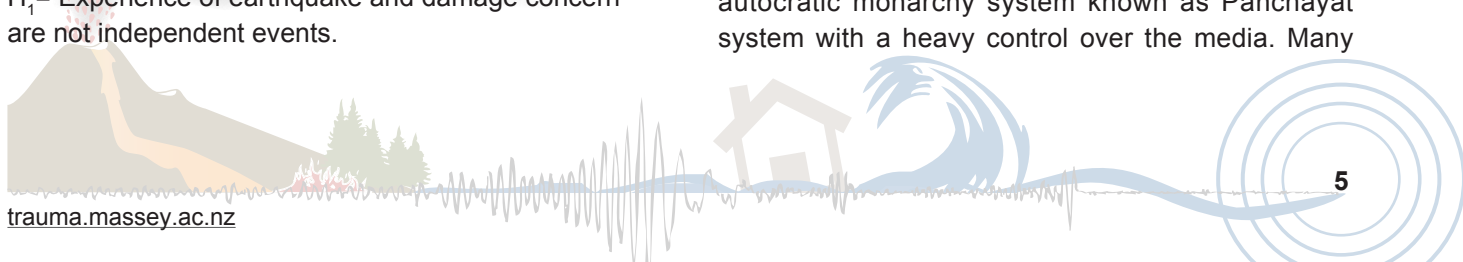
**Figure 3.** Flow diagram of research work



**Results and Discussion**

**Descriptive analysis of the respondents**

Out of 430 respondents, 80 respondents did not respond to the query regarding the preparedness and concern, so they were removed from the analysis. Therefore, views of only 350 respondents were used for the analysis. High proportion (91.1%) of respondents had experienced an earthquake in their lifetime while 8.9% had no experience. Likewise, 92.6% respondents were concerned about future earthquake damage while 7.4% were not concerned. This change can be attributed to the increase in the awareness following the political change in 1990 A.D. Before that, the country had a single-party autocratic monarchy system known as Panchayat system with a heavy control over the media. Many





organizations and groups have been making efforts towards sensitizing people including through providing disaster related information. During the interview, it was found that 49.7% respondents were prepared for an impending earthquake while 50.3% had undertaken no preparation. A high proportion (92.6%) respondent with an experience of earthquake also expressed concern about damage, as seen in Table 2. This may be also due to the belief among many people that severe earthquake will not come in their lifetime. Likewise, only half (49.7%) of respondents who expressed concern for future damage had undertaken preparedness and about half (49.7%) of the respondents having experience of earthquake had undertaken as seen in Table 3 and 4.

**Statistical analysis result**

Results from the Chi square hypothesis testing can be seen in Table 5 and are elaborated for each case as following:

Case 1

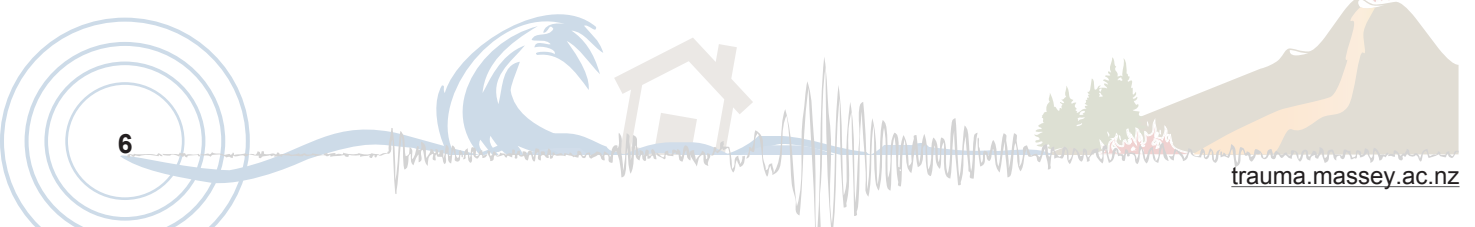
It was found that there is statistically significant relationship between the variables viz., experience of earthquake and damage concern (chi-square with 1 degrees of freedom = 289.01,  $p = .000$ ). The phi coefficient of association is 0.909. This means earthquake experience and concern about damage are dependent events. Based on the sample information, it can be said that when people undergo through

**Table 2.** Cross tabulation of earthquake experience by damage concern

			Concern about future damage		Total
			Concern	No concern	
Experience of earthquake	Yes	Count	319	0	319
		% within Experience of earthquake	100.0%	.0%	100.0%
		% within Concern to damage	98.5%	.0%	91.1%
	% of Total	91.1%	.0%	91.1%	
	No	Count	5	26	31
		% within Experience of earthquake	16.1%	83.9%	100.0%
% within Concern to damage		1.5%	100.0%	8.9%	
% of Total	1.4%	7.4%	8.9%		
Total	Count	324	26	350	
	% within Experience of earthquake	92.6%	7.4%	100.0%	
	% within Concern to damage	100.0%	100.0%	100.0%	
	% within Concern to damage	100.0%	100.0%	100.0%	

**Table 3.** Cross tabulation of earthquake preparedness by damage concern

			Preparedness		Total
			Yes prepared	No preparedness	
Concern to damage	Concern	Count	174	150	324
		% within Concern about damage	53.7%	46.3%	100.0%
		% within Preparedness	100.0%	85.2%	92.6%
	% of Total	49.7%	42.9%	92.6%	
	No concern	Count	0	26	26
		% within Concern to damage	.0%	100.0%	100.0%
% within Preparedness		.0%	14.8%	7.4%	
% of Total	.0%	7.4%	7.4%		
Total	Count	174	176	350	
	% within Concern to damage	49.7%	50.3%	100.0%	
	% within Preparedness	100.0%	100.0%	100.0%	
	% of Total	49.7%	50.3%	100.0%	



**Table 4.** Cross tabulation of earthquake experience by damage concern

			Preparedness		Total
			Yes prepared	No preparedness	
Experience of earthquake	Yes to experience	Count	174	145	319
		% within Experience of earthquake	54.5%	45.5%	100.0%
		% within Preparedness	100.0%	82.4%	91.1%
		% of Total	49.7%	41.4%	91.1%
	No to experience	Count	0	31	31
		% within Experience of earthquake	.0%	100.0%	100.0%
		% within Preparedness	.0%	17.6%	8.9%
		% of Total	.0%	8.9%	8.9%
	Total	Count	174	176	350
% within Experience of earthquake		49.7%	50.3%	100.0%	
% within Preparedness		100.0%	100.0%	100.0%	
% of Total		49.7%	50.3%	100.0%	

earthquake experience, they become more concerned about the future earthquake damage.

**Case 2**

Likewise, there is significant relationship between the damage concern and earthquake preparedness (chi-square with 1 degrees of freedom = 27.767, p = .000). The phi coefficient of association is 0.282.

This means that concern about earthquake damage and preparedness are dependent events. Based on

the sample information, it can be said that the higher the damage concern people have, the more likely they are to be prepared for earthquakes.

**Case 3**

Similarly, there is significant relationship between the earthquake experience and earthquake preparedness (chi-square with 1 degrees of freedom = 33.62, p = .000). The phi coefficient of association is 0.310. From this, it can be concluded that those having the earthquake experience tend to be more prepared.

**Table 5 (i).** Chi-Square Tests. Earthquake experience by damage concern

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	289.018(b)	1	.000		
Continuity Correction(a)	276.951	1	.000		
Likelihood Ratio	157.819	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	288.193	1	.000		
N of Valid Cases	350				

a Computed only for a 2x2 table

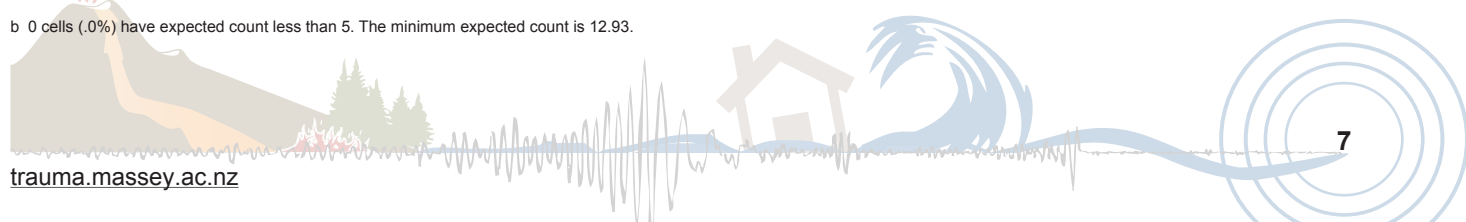
b 1 cells (25.0%) have expected count less than 5. The minimum expected count is 2.30.

**Table 5 (ii).** Chi-Square Tests. Damage concern and earthquake preparedness

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	27.767(b)	1	.000		
Continuity Correction(a)	25.661	1	.000		
Likelihood Ratio	37.812	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	27.688	1	.000		
N of Valid Cases	350				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 12.93.



**Table 5 (iii).** Chi-Square Tests. Experience of earthquake and preparedness

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	33.626(b)	1	.000		
Continuity Correction(a)	31.480	1	.000		
Likelihood Ratio	45.604	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	33.530	1	.000		
N of Valid Cases	350				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.41.

## Conclusion and Recommendation

It is said that people will be more motivated to prepare themselves once they feel and observe a disaster but after a disaster, the correlations of risk perception with the adoption of hazard adjustments tend toward zero as time moves on (Weinstein and Nicolich 1993). After the 1988 Eastern Nepal earthquake, Kathmandu has not experienced major earthquake and only has watched devastating earthquakes in India, Turkey, and Algeria through the media.

It was revealed from the survey that earthquake experience and concern for damage from a future earthquake among respondent are related events. Likewise, people with damage concern are more prepared and people with earthquake experience tend to have better preparedness. The result is also consistent with the other studies which indicate to the fact that the people start to increase preparedness measures once they get warning of earthquake or feel the earthquake themselves (Turner et al 1986, Mulilis et al 1990, Mileti and O'Brien 1992, Mileti and Fitzpatrick 1992, 1993; Showalter 1993, Farley et al 1993, Mileti and Darlington 1995, Dooley et al 2006). Since, experiencing a large earthquake in the area is not a common phenomenon in one's lifetime, it is recommended to utilize a system of providing an experience to those who have not experienced an earthquake. Figure 4 shows the mobile vehicle employed in Japan for simulation of earthquake environment. Here, the situation similar to the 1995 Kobe earthquake is simulated thereby giving the experience of an earthquake. This simulation helps individuals to experience an earthquake scenario. As discovered in the studies and research that personal experience affects responses to hazards (Weinstein 1983), similar simulation environment like the 1934 great earthquake can be introduced through use of simulation vehicle in Nepal to increase awareness and

preparedness. A simulation environment can help to raise concern about future damage, and may be very effective in achieving the goal of seismic safety.



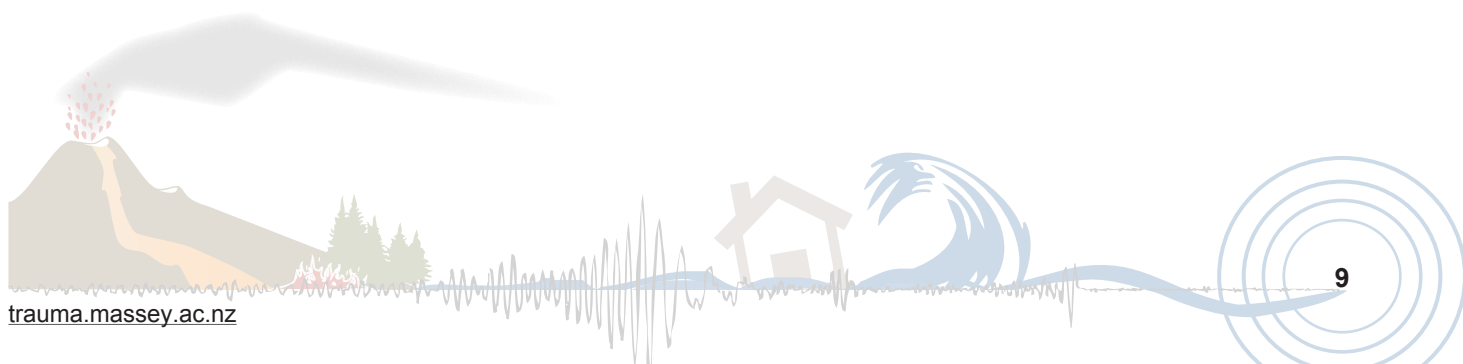
**Figure 4.** Earthquake simulation vehicle employed in Japan. This vehicle simulates the 1995 Kobe earthquake environment.

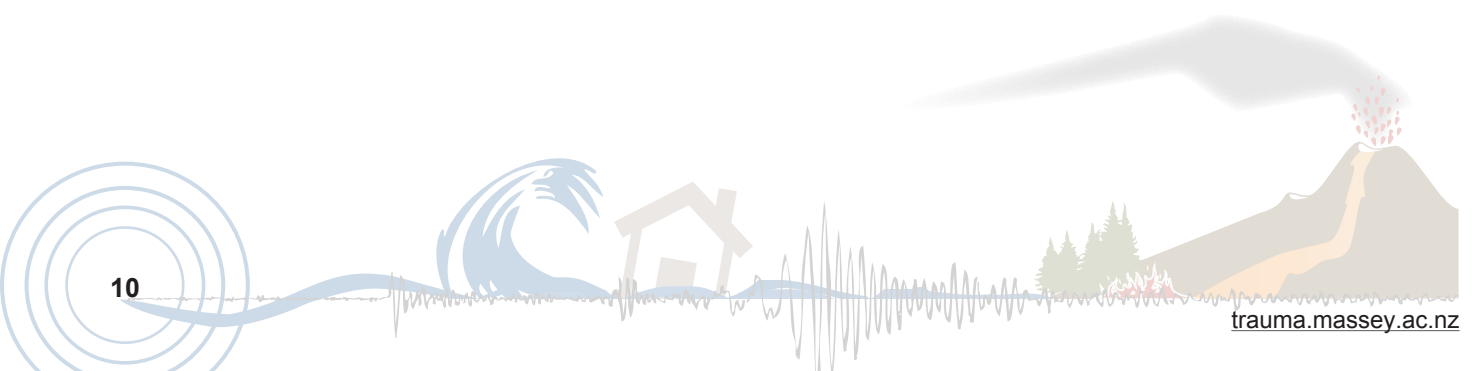
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# Organisational Resilience and Recovery for Canterbury Organisations after the 4 September 2010 Earthquake

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## Abstract

*The 4 September 2010 Mw 7.1 Darfield earthquake had major physical, economic and social effects on organisations in Canterbury, New Zealand. This paper presents the results of a survey conducted between November 2010 and February 2011 of organisations based in the Canterbury region. Sampled organisations include those belonging to six industry sectors: fast-moving consumer goods (FMCG), trucking, information and communication technology (ICT), hospitality, building suppliers and critical infrastructure. Also included are organisations from the Christchurch and Kaiapoi central business districts (CBDs) as well as rural organisations proximal to the fault trace.*

*Organisational recovery after the earthquake will be a major undertaking and the challenges vary for different organisations and industry sectors. This paper analyses the initial effects of the 4 September event across industry sectors and geographic areas. It also highlights possible interdependencies and system characteristics that affect recovery for these organisations and industry sectors. Other factors considered include the specific challenges organisations faced after this major hazard event.*

**Keywords:** *organisations, disaster, resilience, recovery, industry sector, earthquake.*

## Introduction

On 4 September 2010, the Canterbury region of New Zealand was shaken by a Richter  $M_w$  7.1 earthquake. The epicentre was in Darfield, a town approximately 40km west of Canterbury's largest city, Christchurch. The intensities of the event in different areas ranged from MM3 to MM9<sup>1</sup>. In addition to the impacts of the global recession, organisations across Canterbury were faced with recovery from the earthquake and subsequent aftershocks. However, organisations were also presented with new opportunities in the post-disaster environment.

The Canterbury region is a significant part of the New Zealand economy. Half of all South Island businesses, accounting for 53% of South Island employees, are located in Canterbury (Statistics New Zealand, 2011). This paper presents the results of a survey which forms the first part of a two year study investigating the factors influencing recovery for individual organisations<sup>2</sup> and industry sectors in Canterbury after the 4 September earthquake. The survey explored organisational impacts, challenges, mitigation and preparedness in relation to this event. In addition, this study includes the recovery of both urban and rural organisations. Understanding how post-disaster outcomes manifest for different types of organisations and industry sectors will help stakeholders and decision-makers tailor planning, mitigation, response and recovery strategies that are appropriate for different sectors and for different geographic locations.

Figures from the New Zealand Treasury Department (2010) put the combined loss from the 4 September earthquake at \$5 billion NZD. This aggregated amount masks the variations among individual organisations, sectors and geographic locations. In addition, the effects of disaster exceed physical damage to buildings, stock

1 The Modified Mercalli (MM) scale measures felt shaking intensity on the Earth's surface, and consists of a series of "key responses" such as people awakening, furniture moving, and property damage (USGS, 2009).

2 In this paper, "organisation" refers to businesses, not-for-profit organisations and government agencies of a range of sizes. The terms organisation and business will be used interchangeably throughout the paper.

and infrastructure. Organisations affected by disaster also face disruptions that flow on to the community and other organisations that depend on them (Tierney & Nigg, 1995; Webb, Tierney, & Dahlhamer, 1999). For the purposes of recovery, estimates of disaster impacts should include losses caused by other factors such as business interruption, decreased customer numbers and property devaluation experienced by organisations post-disaster (Rose & Lim, 2002; Wood, 2008).

Recovery from a disaster is a complex and interconnected process, and is not a guaranteed outcome for affected organisations. Recovery is defined here as “longer-term efforts to reconstruct and restore the disaster-stricken area, e.g, through repairing or replacing homes, businesses, public works, and other structures” (Tierney, 1993b, p. 1).

## Literature Review

There has been an increasing trend in the communicated cost of natural disasters globally (Munich Re, 1999) and recovery from these disasters can account for a significant proportion of national economies (Benson & Clay, 2004; Munich Re, 1999). Direct losses include damage to premises, infrastructure, equipment and loss of revenue resulting directly from the event (Cochrane, 2004). Indirect losses, which are difficult to measure, include income loss due to supply chain issues or decreased sales caused by customer income losses (National Research Council, 1999). It has been shown that indirect losses can surpass property damage in cost and pervasiveness (National Research Council, 1999). Rose and Lim (2002) state that business interruption losses are possible even without physical or property damage and can result from interdependencies and flow-on effects between organisations, employees, suppliers and customers.

Also, the trajectory of economic trends within business sectors is influenced by disasters (Benson & Clay, 2003). For instance, it is expected that the retail sector suffers loss of revenue while the construction and manufacturing sectors experience a boom in the wake of a disaster (Boarnet, 1997; Tierney & Webb, 2001). According to Registered Master Builders New Zealand, there was a dip in construction sector revenue after the September 2010 event which only started to rise in February 2011 (RMBF, 2011). Tracking the timing and distribution of economic impacts across sectors is important for providing appropriate support for sectors post-disaster.

In the literature, it is recognised that factors such as the type of organisation and industry sector, the size of the organisation and its location contribute to how different organisations and sectors recover from disaster. Other factors that contribute to recovery include the age of the organisation, owning or renting business premises and the level of organisational disaster preparedness (Alesch, Holly, Mittler, & Nagy, 2001; Nigg, 1995; Tierney & Dahlhamer, 1997). For instance, small businesses are more vulnerable to disaster due to restricted access to resources and networks that are available to larger organisations (Alesch et al., 2001; Chang, Seligson, & Eguchi, 1996). It is acknowledged that post-disaster recovery of small business plays a vital role in the economic and social recovery of a community (Pelling, 2003).

Furthermore, there is an emerging body of literature that links an organisation’s level of resilience to its recovery (Bruneau et al., 2003; Chang, Rose, Shinozuka, Svekla, & Tierney, 2000). Resilience is an umbrella concept reflecting an organisation’s ability to not only survive but to be able to thrive through times of adversity (Seville et al., 2008). More needs to be understood about how different types of organisations are affected by disaster, the factors that influence recovery, and how long after disaster they recover (Galbraith & Stiles, 2006).

## Methods

This survey was designed to capture the initial impacts and perceptions of organisations affected by the 4 September earthquake. The survey employed a combination of concepts from qualitative and quantitative research. Data were collected using Dillman’s (1978) total design method, adapted to this work. Questionnaires were mailed to organisations. This was followed by a telephone call where organisations were given the option of completing the survey by phone or in a personal visit with a member of the research team, using an online survey tool or returning it by post or e-mail. The multi-media approach was designed to cater for those organisations that might have relocated, closed or were too busy to complete the telephone survey during work hours. The final response rate was greatly improved by the flexible format approach to data collection.

The survey included a shortened form of the Organisational Resilience Measurement Tool (McManus, 2008; Stephenson, 2010) developed by the Resilient

Organisations Research Programme. The shortened version of the Tool was used to obtain a snapshot of the resilience profile of sampled organisations. The full version of the Resilience Measurement Tool will be deployed in later parts of the study.

### Sample

A cross-section of industry sectors were strategically selected for this study to reflect various elements of the Canterbury economy. Within each of these sectors, organisations were randomly selected to be invited to take part in the study.

The sectors included were:

- Information and Communication Technology (ICT) – a high-growth sector identified as a key component of Canterbury’s regional economic plan
- Critical infrastructure (lifelines) – for provision of services vital to recovery
- Hospitality (cafes, restaurants and bars) – to analyse recovery through consumer discretionary spend
- Fast moving consumer goods (FMCG) – including product producers, supermarkets, dairies, and petrol stations to analyse recovery through consumer non-discretionary spending
- Trucking – important part of supply chain for many industry sectors and
- Building Suppliers – for their involvement in the rebuilding process.
- Christchurch and Kaiapoi Central Business Districts (CBDs) - because they are retail hubs and represent an aggregation of organisations in one locality.
- Rural farm - organisations close to the fault trace and also a high-growth sector part of Canterbury’s regional economic plan
- Rural non-farm –rural farm support organisations

### Results

The results of this survey highlight the effects of the 4 September earthquake on the Canterbury economy by analysing impacts to particular sectors and the possible interdependencies between them. In the first part of the survey organisations were asked for demographic information. Respondents were then asked whether they had been affected by the 4 September earthquake. Those that responded “no” were directed to complete only the organisational resilience portion of the survey. Eighty per cent of sampled organisations reported having been affected by the earthquake. All results

herein, which describe organisational impact and mitigation information are from organisations that reported being “affected” by the earthquake.

### Survey response rate

Of the 869 organisations contacted for the survey, 376 usable responses were returned, giving an overall response rate of 36 per cent. The industry sectors with the highest response rates, by percentage, were ICT and critical infrastructure while that with the lowest was rural farm. Figure 1 shows the response rates for all the sectors sampled.

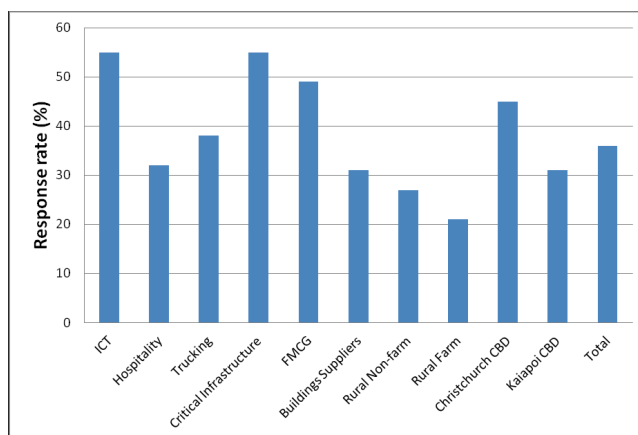


Figure 1: Organisational Resilience and Recovery Survey – response rate by sector

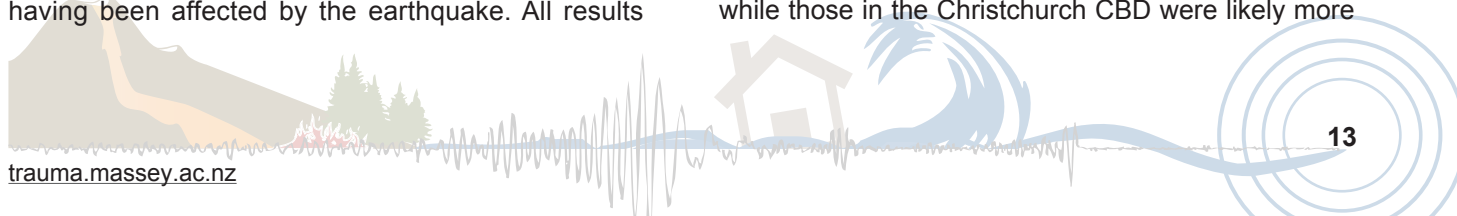
### Organisation level information

Table 1 shows the average number of employees and periods of operation of organisations, by sector.

The sample consists primarily of small businesses, reflecting New Zealand’s organisational demographic profile (Welch, 2008). Organisations from the critical infrastructure and FMCG sample groups were found to be the oldest organisations and the largest employers in the sample. At the time of the survey, 67 per cent of all organisations had been in operation at least 10 years. Williams (1987) demonstrates that it takes eight years to achieve long-term profitability. Therefore, older organisations are more likely to have additional internal resources to support their recovery.

### Affected organisations and duration of closure

The highest proportion of organisations reporting being affected by the earthquake were from the Kaiapoi and Christchurch CBDs, hospitality and critical infrastructure sample groups. Organisations in the Kaiapoi CBD were affected by extensive liquefaction and lateral spread while those in the Christchurch CBD were likely more





**Table 1:** Organisation level information

Sector	Number of Employees						Years in operation	
	Full-time		Part-time		Temporary		Mean	Median
	Mean	Median	Mean	Median	Mean	Median		
ICT	18	6	2	2	3	1	15	11
Hospitality	9	5	18	7	1	1	13	10
Trucking	31	10	9	2	1	1	33	24
Critical Infrastructure	233	112	41	13	192	4	80	100
FMCG	154	75	63	52	4	0	38	24
Buildings Suppliers	11	7	2	1	1	1	25	20
Rural Non-farm	9	2	3	2	11	2	25	11
Rural Farm	35	2	2	2	1	1	34	28
Christchurch CBD	15	3	29	3	2	2	35	30
Kaiapoi CBD	5	3	4	2	1	1	35	20
Total	46	5	17	3	26	1	31	19

affected by the official cordons placed around the CBD area in the days and weeks after the earthquake. The high number of organisations affected in the hospitality sector corresponds with their location; a large portion of the hospitality sample was located in or around the Christchurch CBD area. Lastly, the proportion of critical infrastructure organisations affected might be due to the placement of their infrastructure making it especially vulnerable to ground shaking (e.g buried cables or pipes) and because their services were in high demand immediately after the earthquake. The percentage of affected organisations, by sector, is shown in Table 2.

**Table 2:** Affected organisations and duration of closure

Sector	Affected by 4 September earthquake (%)	Duration of closure (days)	
		Mean	Median
ICT	56%	3	2
Hospitality	94%	8	7
Trucking	71%	11	2
Critical Infrastructure	92%	4	3
FMCG	88%	2	1
Buildings Suppliers	70%	3	2
Rural Non-farm	88%	5	4
Rural Farm	67%	2	2
Christchurch CBD	90%	9	7
Kaiapoi CBD	90%	11	7
Total	80%	7	4

Sixty-three per cent of affected organisations closed for some time following the earthquake. From Table 2, it can be seen that rural farm and FMCG organisations closed for the least amount of time. For rural farm, this is due in part to rural farm organisations not closing in the way organisations in other sectors would. On average,

organisations from the trucking sector and Kaiapoi CBD were closed the longest. The average duration of closure for the entire sample was seven days.

Organisations were presented with a list of reasons that may have contributed to the organisation's closure after the earthquake. The two reasons most cited for closure in the CBDs and the hospitality sector were "building waiting to be structurally assessed" and "damage to immediate locality". Approximately 50 per cent of respondents also cited "clear up damage to interior" as one of the reasons for closure. In addition, closure because of "stock loss or damage" featured prominently for the FMCG and hospitality sectors. Reasons for this include breakage caused by shaking, loss of refrigeration due to power outages and the short shelf life of putrescibles.

Only 25 per cent of trucking organisations reported closing for any period of time following the earthquake. This is likely due to locational flexibility (e.g. many can operate to some extent even with limited access to their building) and also because of the minimal earthquake damage to road networks they use.

The closure of some organisations had supply- and demand-side effects on other organisations. The trucking industry reported that one of their challenges was the lack of warehousing. First, they could not deliver goods because receiving organisations were closed, and then there was increased demand for trucking and supply services when organisations were ready to re-stock. Lastly, there was the additional challenge of decreased warehousing space caused by damage to racking and shelving units.

**Table 3:** Capability of new and regular supplier

	Capability of regular suppliers			Need to use new suppliers		How well new suppliers met needs		
	Completely capable	Somewhat capable	Completely incapable	No	Yes	Completely capable	Somewhat capable	Completely incapable
ICT	40%	13%	2%	53%	4%	2%	2%	0%
Hospitality	47%	38%	6%	78%	13%	3%	9%	0%
Trucking	42%	21%	5%	63%	5%	3%	3%	0%
Critical Infrastructure	58%	33%	0%	75%	17%	17%	0%	0%
FMCG	29%	57%	2%	62%	26%	10%	17%	0%
Buildings Suppliers	53%	17%	3%	70%	3%	0%	0%	3%
Rural Non-farm	55%	21%	5%	74%	12%	0%	10%	0%
Rural Farm	50%	13%	3%	63%	3%	3%	0%	0%
Christchurch CBD	52%	27%	6%	85%	3%	3%	0%	0%
Kaiapoi CBD	50%	25%	3%	80%	10%	3%	8%	0%
Total	46%	26%	4%	69%	10%	4%	5%	0%

When organisations were asked about the ability of their regular suppliers to meet their needs, 46 per cent of affected organisations reported their regular suppliers were “completely capable” while 26 percent reported that they were “somewhat capable”. For FMCG however, close to 57 per cent of respondents reported their suppliers as being “somewhat capable” and only 28 per cent thought their suppliers “completely capable”. Twenty-six per cent of FMCG and 17 per cent of critical infrastructure organisations reported the need to use new suppliers. For critical infrastructure, this might be a result the sharp increase for products used for repair and replacement after the earthquake. Information about supplier capability for each sector is presented in Table 3.

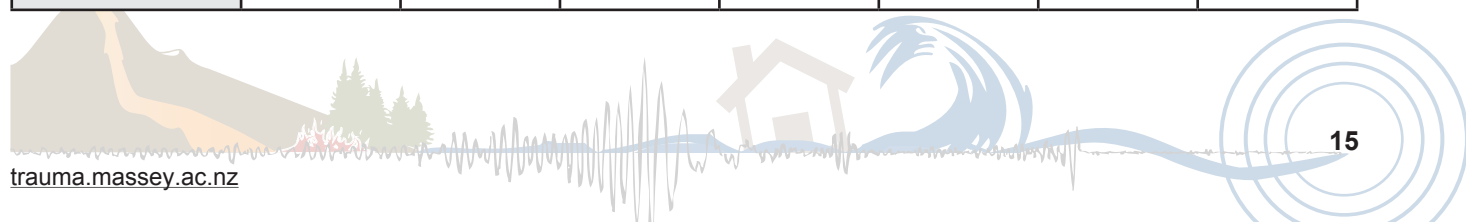
**Insurance**

Insurance against hazard events can be used by organisations to mitigate loss. However, deciding the financial value for insurance of low probability events such as earthquakes can be difficult (Kunreuther, 2002). Sampled organisations were presented with a list of insurance options. Across the sample, the most common types of insurance were “public liability” (60%) and “organisation assets and equipment” (59%), as seen in Table 4.

Sectoral differences in insurance may reflect differing organisational requirements as well as varying perceptions of risk. The two most cited types of insurance for ICT organisations were “public liability” and “assets and equipment”. This is likely because ICT organisations want to protect themselves against

**Table 4:** Percentage of organisations with the different insurance types

Sector	Cash flow, income protection and organisation interruption	Property and buildings	Organisation assets and equipment	Motor Vehicles	Public liability	Commodities and goods	Other
ICT	24%	27%	49%	31%	44%	20%	15%
Hospitality	78%	47%	75%	44%	69%	63%	0%
Trucking	37%	45%	50%	47%	50%	24%	16%
Critical Infrastructure	38%	54%	50%	54%	67%	33%	42%
FMCG	62%	57%	62%	62%	64%	60%	21%
Buildings Suppliers	43%	43%	57%	57%	63%	50%	10%
Rural Non-farm	43%	76%	69%	57%	69%	50%	2%
Rural Farm	23%	63%	33%	63%	47%	33%	7%
Christchurch CBD	70%	48%	73%	55%	64%	70%	12%
Kaiapoi CBD	45%	40%	68%	38%	68%	35%	13%
Total	45%	49%	59%	49%	60%	43%	13%



claims should their clients suffer loss and seek recompense and also because they rely heavily on their equipment for the operation of their organisation. Critical infrastructure organisations were also more like to have “public liability” insurance than any other. The ICT and rural farms were the least likely to have “cash flow, income protection and organisation interruption” insurance, while the hospitality sector and organisations in the Christchurch CBD sample were most likely to have it. This may reflect the varying nature and importance of cash transactions for the different sectors.

In the “other” insurance category, some of the building suppliers and critical infrastructure reported being self-insured. Self-insurance is often opted for when organisational wealth is higher and risk perception is relatively low (Ganderton, Brookshire, McKee, Stewart, & Thurston, 2000). In the case of critical infrastructure, following several hazard events in Canterbury in the early 2000s, private insurance costs had increased dramatically, making insuring assets uneconomical. Therefore, some organisations opted for self-insurance and adopted mitigation measures such as seismically reinforcing structures housing important assets and upgrading equipment to decrease the risk of loss (Eidinger, Tang, & O'Rourke, 2011).

Organisations were also asked about their relationships with their insurer, their banker and also how satisfied they were with their insurance package on a scale from “very dissatisfied” to “very satisfied”. From the overall sample, 18 percent of organisations reported feeling “very satisfied” with their insurer while 29 per cent were “satisfied”. Twenty-four per cent of all sampled organisations were “very satisfied” with their banker and 25 per cent were “satisfied.” More organisations from FMCG than from any other sector reported being “very satisfied” with their insurer, insurance package and banker at 36 per cent, 33 per cent and 38 per cent respectively. Pre-disaster, banks may require compliance with building codes before providing mortgages and loans, and insurers can finance mitigation measures which may reduce future losses (Kunreuther, 1996). Having a good relationship with the banking and insurance sectors may help organisations to arrange the best insurance and banking packages for their organisations.

### Decisions affecting recovery

Organisations work in an increasingly interdependent environment where they are affected by the decisions

of others. It is therefore necessary to examine and understand organisational recovery from a system dynamics perspective, and how post-disaster decisions made by others, which organisations have little control over, can affect recovery. Some of the decisions cited as affecting organisations in the sample group include:

- damage to nearby buildings
- official cordons around nearby buildings
- delayed insurance payouts
- the duration of ongoing building inspections
- road closures and official curfew

Organisations reported all of the above as having other flow-on effects that led to varying levels of business interruption and loss of revenue. As a result of building inspection delays, owners could not access their premises and in some cases employees were reluctant to work from buildings they perceived unsafe. In addition, some organisations in the Christchurch CBD reported that cordons around nearby buildings gave customers the perception that the CBD was “closed”. Also, as the rebuilding work did not start for a while after the earthquake, partly due to inspections and delayed insurance payouts, some building supply organisations reported difficulties deciding what material to stock or produce for when the work commenced.

Furthermore, the decisions made by an organisation in the immediate aftermath of disaster can influence not only their long-term recovery but that of other organisations also (Dietch & Corey, 2011). In the survey, organisations were presented with a series of statements about their organisation and asked to what extent they agreed or disagreed with the statement. Results for the total sample showing only “agree” and “strongly agree” are given in Table 5.

The critical infrastructure sector had the largest numbers of organisations “strongly agree” with all the statements. As discussed above, this is likely because critical infrastructure organisations realise how vital they are to other organisations and to the community as well as the preparedness exercises they are likely to engage in. More organisations “agreed” that “the way we plan for the unexpected is appropriate, given the people and organisations that count on us” than with any other statement.

Organisations from the building supply and rural farm sectors were more likely to “agree” that “there would be good leadership if our organisation were struck by a crisis”. Overall, 54 per cent of organisations “agreed”

**Table 5:** Organisation level statements

		ICT	Hospitality	Trucking	Critical Infrastructure	FMCG	Buildings Suppliers	Rural non-farm	Rural Farm	Christchurch CBD	Kaipoi CBD	Total
There would be good leadership if our organisation were struck by a crisis	Agree	49%	53%	45%	42%	45%	77%	48%	67%	64%	65%	54%
	Strongly Agree	40%	28%	45%	58%	48%	17%	38%	20%	30%	23%	35%
Our organisation has clearly defined priorities for what is important during and after a crisis	Agree	45%	53%	42%	38%	48%	57%	50%	60%	61%	45%	49%
	Strongly Agree	11%	22%	24%	58%	36%	10%	26%	20%	21%	23%	24%
When we need to, our organisations can make tough decisions quickly	Agree	53%	53%	34%	50%	33%	60%	43%	53%	58%	60%	49%
	Strongly Agree	36%	28%	50%	50%	60%	23%	43%	33%	42%	30%	40%
Our organisation keeps in contact with organisations it might have to work with in a crisis	Agree	35%	44%	37%	46%	50%	27%	40%	50%	42%	48%	41%
	Strongly Agree	5%	6%	21%	54%	24%	3%	21%	23%	21%	13%	18%
Our organisation monitors what's happening in its industry	Agree	58%	47%	39%	33%	40%	47%	48%	60%	64%	50%	49%
	Strongly Agree	24%	19%	34%	63%	45%	13%	38%	13%	24%	25%	29%
I believe the way we plan for the unexpected is appropriate, given the people and organisations that count on us	Agree	65%	75%	39%	42%	55%	70%	64%	63%	67%	53%	59%
	Strongly Agree	16%	0%	32%	54%	26%	7%	14%	10%	15%	18%	19%
Our organisation is focused on being able to respond to the unexpected	Agree	55%	47%	39%	38%	57%	70%	50%	67%	58%	48%	53%
	Strongly Agree	11%	13%	32%	54%	26%	7%	17%	13%	18%	20%	20%

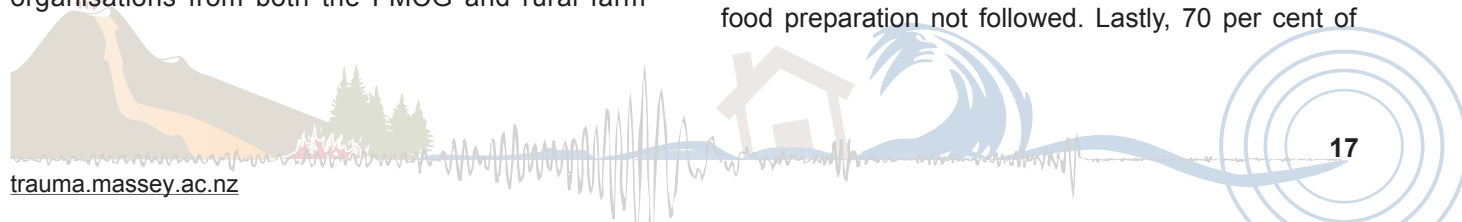
with this while 35 per cent “strongly agreed”. This corresponds with the high number of all organisations (89 per cent) that either “agreed” or “strongly agreed” with the statement “when we need to, our organisations can make tough decisions quickly”. Regardless of industry sector or organisation size, good leadership is necessary for decision-making and to effectively manage staff in a high stress crisis environment.

For the statement “our organisation has clearly defined priorities for what is important during and after a crisis”, 49 per cent of the total sample “agreed” and 24 per cent “strongly agreed”. These priorities may be specified as part of the organisation’s crisis preparedness activities and adapted as necessary post-disaster. These preparedness activities could include defining the minimum resources the organisation needs to get through a crisis and the steps necessary to ensure staff well-being and business continuity.

For “our organisation keeps in contact with organisations it might have to work with in a crisis”, 50 per cent of organisations from both the FMCG and rural farm

sectors “agreed” and 54 percent of critical infrastructure “strongly agreed”. This is in contrast with organisations from building suppliers, ICT and hospitality where only 3, 5 and 6 per cent respectively “strongly agreed”. Having information on for example where and how to access aid or what part of the supply chain is broken can help an organisation’s recovery. The highest percentage of organisations to “agree” that their “organisation monitors what's happening in its industry” were from the Christchurch CBD (64%), rural farm (60 per cent) and ICT (58 per cent). For rural farm and ICT, this is likely because the trends in these sectors change very often. Also, knowledge of industry trends can be used to formulate corporate strategy post-disaster. For instance, an organisation might diversify to other markets while its local market was in recovery.

The hospitality sectors had the highest number of organisations (75 per cent) “agree” that “the way we plan for the unexpected is appropriate, given the people and organisations that count on us”. This is possibly because of health and safety concerns were the regulations for food preparation not followed. Lastly, 70 per cent of





building suppliers “agreed” with the statement “Our organisation is focused on being able to respond to the unexpected”.

### Challenges and Opportunities

Disasters present both challenges and silver linings for organisations. In this survey, organisations were asked to report the “biggest challenges” they faced following the 4 September earthquake. Across all sectors and geographic areas, the most commonly reported “biggest challenge was the wellbeing of staff. However, other sector specific challenges also emerged.

Apart from difficulty forecasting demand, building suppliers also reported reduced sales while they waited for the rebuilding work to restart. Organisations in the construction industry were aware that there would eventually be a surge in demand for their services, but delays caused by ongoing aftershocks and lags in insurance pay-outs made it difficult to predict when reconstruction work would begin in full. Further, uncertainty about employment prospects might lead to skilled workers in this industry migrating out of Christchurch, causing a skills shortage when the rebuilding work starts in earnest (Tertiary Education Union, 2011). Conversely, as the economic landscape of Canterbury has changed, new skills will be required across many sectors, partly to re-train people who lost their jobs to re-enter the job market and also because of the need for specific skills (e.g insurance loss adjustors, builders) as a result of the earthquake (TVNZ, 2011).

The CBD and hospitality sectors cited cash flow, reduced customer numbers and reduced consumer spending as major challenges. This could be a result of changed consumer habits as they reduce spending due to uncertainty about the future economic climate. It could also be due to consumers continuing to shop in the suburbs even after the CBD shops reopened. The hospitality sector also noted problems with staff availability. This might be due to population outflow after the earthquake or that staff were not prepared to work from the CBD due to the perception that buildings were unsafe.

Several ICT organisations, on the other hand, reported their biggest challenge was dealing with increased demand for their services. This is possibly due to organisations adopting new technologies after the earthquake to do their business, as part of hazard mitigation and preparedness as well as the need to repair and replace damaged equipment. Trucking,

rural non-farm and FMCG biggest challenges included issues with supply chain and logistics. This brings to light the need for organisations to practice effective risk management for their entire supply chain, for instance by having more than one supplier or by product substitution where possible. Following the earthquake, organisations have the opportunity to re-evaluate and create a more resilient supply chain.

### Conclusion

Post-disaster recovery is a complex economic, political, social and physical process. The physical damage to an organisation’s property can be considered a one-off whereas the flow-on effects are not immediately apparent and linger for some time. Recovery is not just about rebuilding infrastructure, it should also be used to plan for future economic growth.

There are several factors that will act as determinants in the recovery of organisations. It is important to recognise which of these has the more substantial effects as well as how the effects on one sector impact other sectors.

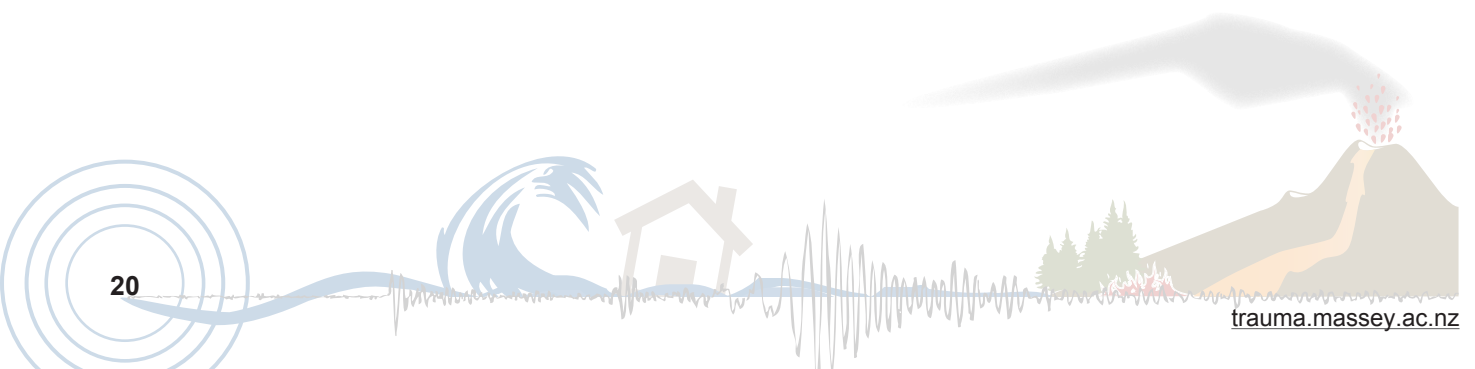
The organisations in Canterbury had started on the path to recovery when they faced another devastating earthquake on 22 February 2011. Future work in this study will take into consideration the effects of this later event. Another outcome of the study will be the comparison of the determinants of recovery for different industry sectors, as well as the interdependencies and system dynamics as a result of the commerce between them. The factors important to recovery after disaster will inform organisations, policy makers and other interested parties on what to prioritise in the response and recovery stages after an event.

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# Climate change and mental health following flood disasters in developing countries, A review of the epidemiological literature: What do we know, what is being recommended?

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URL: [http://trauma.massey.ac.nz/issues/2012-1/AJDTS\\_2012-1\\_Crabtree.pdf](http://trauma.massey.ac.nz/issues/2012-1/AJDTS_2012-1_Crabtree.pdf)

## Abstract

*Among the expected consequences of climate change are extreme weather events, increased sea levels and the melting of glaciers all of which can lead to an increase in the number of flooding disasters which will impose greater burdens on vulnerable populations. This article reviews the epidemiological literature concerning climate related flooding and mental health in developing countries. It also examines what is being recommended. All studies show that there are serious mental health problems following flooding events and this gives us good grounds to mainstream mental health issues in disaster response.*

**Keywords:** *Climate Change, Flooding, Mental Health*

## Introduction

Estimates suggest that for the years 2000–9 flooding affected approximately 949 million people worldwide. The vast majority of these, 900 million, lived in countries of medium human development (IRFC, 2010). If the assessments of the Intergovernmental Panel on Climate Change (IPCC) are correct, climate change is now with us (IPCC, 2007). Among the expected consequences are extreme weather events, increased sea levels and the melting of glaciers all of which can lead to an increase in the number of flooding disasters. This will impose greater burdens on vulnerable populations, and international organizations, governments and NGOs need evidence based plans to meet future risks. An examination of the psychological consequences of flooding is essential both in relation to present and future flooding disasters.

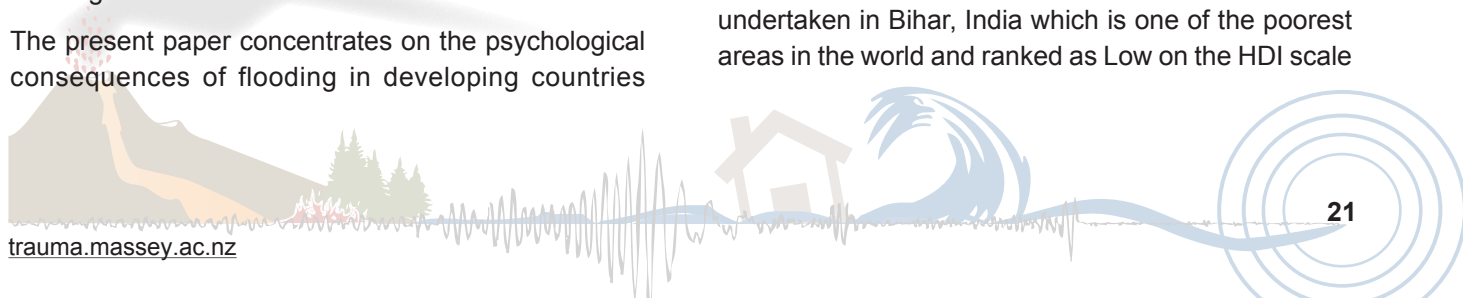
The present paper concentrates on the psychological consequences of flooding in developing countries

which are expected to be affected most and where the consequences are expected to be worse. It reviews the present epidemiological evidence, and the recommendations made, and suggests areas for future research. It is not claimed that any of the events discussed here are due to climate change rather they are the kind of event we can expect from climate change.

## Methods

The definition of “developing country” is contentious, however it is now widely agreed that defining poverty in terms of income alone is inadequate and the notion of income poverty should be replaced by one of multidimensional poverty (World Bank, 2001; Sen, 1999). Here the Human Development Index (HDI), a composite of income, education and longevity, is used. While this does not capture all aspects of multidimensional poverty (e.g. gender issues or social exclusion), it is broader than a purely income approach and has an internationally comparative data sets for a large number of countries since 1990. Introducing other indicators of poverty rapidly reduces the data set as is the case with the Human Development Report’s Multidimensional Poverty Indicator (UNDP, 2010).

The HDI categorizes countries into Very High Human Development, High Human Development, Medium Human Development and Low Human Development (UNDP, 2010). All those countries outside the very high human development category are considered “developing”; this categorization is comparable with the previous most extensive literature review of the mental health consequences of flooding in developing countries and so is used (Norris et al., 2002a). However, it should be noted that HDI levels at country level can be misleading as there can be great variation within countries (in terms of income it is now estimated that three quarters of the world’s poor live in middle-income countries (Sumner, 2010). For example, of the studies reviewed here, Telles et al.’s (2009; 2010) were undertaken in Bihar, India which is one of the poorest areas in the world and ranked as Low on the HDI scale



(UNDP, 2010), whereas India is ranked as Medium. Unfortunately, HDI data for the specific locations of the studies reviewed here is not available and therefore only country level indicators are used. The Polish cases are included as Poland was not of Very High Human Development when the events took place (Poland is also included in Norris et al, 2010).

Having defined “developing country”, literature searches were made in the PsychInfo (American Psychological Association, Washington DC and Medline/PubMed (National Library of Medicine, Bethesda, Maryland) and Google scholar using the words flood, flooding, cyclone, hurricane, mental health and mental disorder, Post Traumatic Stress Disorder, depression, suicide, anxiety in the title, keywords or abstracts. No time limits were placed. Only peer reviewed epidemiological studies were included. Reports were excluded, as were articles relating to Tsunamis as the latter are not related to climate change. This review is, unfortunately, limited to articles published in English. A review covering more languages would be welcome.

## Results

A total of 34 articles met the above criteria (27 relating to Medium Human Development countries (Table 1) and seven to High Human Development countries (Table 2)). This is a much higher number than previous literature review, Norris, (2010) which identified nine in all, however the review was completed in 2005 and a number of studies have been published since then). Tables 1 and 2 provide an overview of the studies that have been undertaken, countries' HDI level, the specific disaster, the time at which the study was carried out, and, when available, the percentage of the target population classified as having or potentially having a given disorder. The tables show, not surprisingly, that in all countries and cultures there are considerable negative mental health consequences of flooding. However, there is sizeable variation among them.

No studies have been undertaken in countries of Low Human Development. The number of articles masks the number of flood events covered (indicated by bands in the tables), for example, four articles concerned the 1998-9 Hunan floods in China, two of which used the same data sets but highlight different aspects of flooding and mental health (Feng et al., 2007; and Huang et al., 2010). Nine studies were carried out within six months

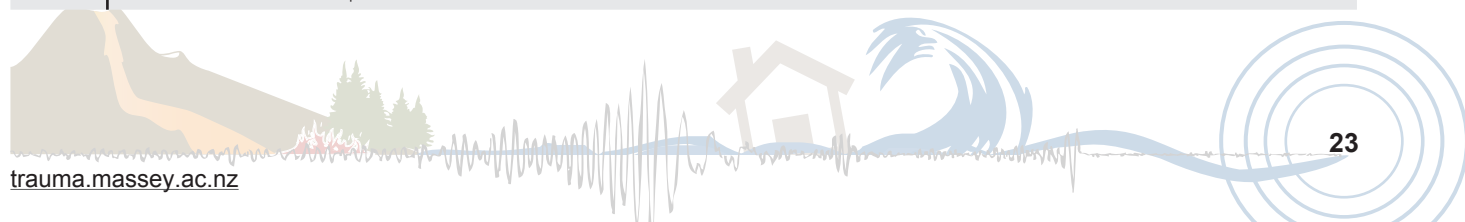
of flood onset, 17 within one year and none were carried out later than two years post. Only three studies were longitudinal. Four studies make comparisons between different places affected by the same flood. A simple distinction between studies of adults and those of children is not possible as different age categorizations are used. Furthermore, even within the same study the desirability of categorizing children of the age range two to nine in the same group (Durkin et al., 1993) is questionable given the considerable developments that take place within those years.

By far the majority (16) investigated Post Traumatic Stress Disorder (PTSD), five examined Major Depressive Disorders (MDD), three suicide, Acute Stress Disorder (ASD), two, and studies that included panic disorder (PD), general anxiety disorder (GAD), alcoholism, and general psychological disorders as measure by the General Health Questionnaire 12 (GHQ 12) were limited to one each. Durkin et al. (1993) examined behavioural disorders among children. An older study (Patrick and Patrick, 1981) included disaster syndrome which is no longer studied. Interestingly, despite the emphasis on PTSD, it is not necessarily the most prevalent disorder. In studies that examined more than one disorder both and found higher rates of major depression disorder - 19.5% compared with 10.6% in Honduras (Kohn et al., 2005) and 5.9% compared with 2.6% in Vietnam (Amstadter et al., 2009). Sample sizes range from 45 (Kar et al., 2002) to 40,028 (Abuaka et al., 2009). It should also be noted that ten per cent prevalence can translate into large numbers of people; Kohn et al. (2005) estimate that 492,000 adults in Honduras suffered from PTSD because of Hurricane Mitch. At the time, Honduras had an adult population of 3.3 million.

There is no straightforward relationship between mental disorders found and HDI level. Some of the poorest countries show low levels of disorders despite the severity of the flooding event, for example Kim et al. (2010) report PTSD levels of 5.4% followings cyclone Nargis in Myanmar which killed at least 84,537 people with a further 53,836 missing. This percentage is just over half that found in Honduras following Hurricane Mitch (10.6%) as a result of which 5,657 were killed and 8,058 were missing (Kohn et al., 2005), or Venezuela where 62% out of a sample population were *diagnosed* as having PTSD. We now turn to the findings concerning specific disorders.

**Table 1 : Mental Health Following Floods in Countries of Medium Human Development**

Country	Disaster	Study	Time after onset	Sample size	PTSD	Depression	Suicide/ Suicide Ideation (SI)	Addictive disorders (alcohol)	Acute Stress Disorder	Acute Psychotic Episode	Panic Disorder	Adjustment Disorder	General Anxiety Disorder	Mental health problem GHQ 12
Bangladesh	Flooding (1988)	Durkin et al (1993) (Children)	Pre-flood & 5 months post	N=162 Children 2-9 years	n.a.									
China	Yangtse Basin (suicide belt)	He ZX (1998)	Period 1973-77				40% above national average							
China	Hunan Floods (1998- 1999)	Liu et al. (2006)	24 months	N=33,340	8.6%									
China	Hunan Floods (1998- 1999)	Feng et al. (2007) & Huang et al. (2010)	24 months	N=25,478	9.2%									
China	Hunan Floods (1998)	Abuaku et al. (2009)	24 months	N=40,028			0.3% (actual suicides)							
China	Hunan Floods (1998)	Li et al.(2010) (Children and parents)		N=4,327 children N=6,584 parents	4.7%	11.2%								
Dominican Republic	Hurricane Georges (1998)	Sattler et al. (2002)	4 weeks post	N=272										
Honduras	Hurricane Mitch (1998)	Kohn et al. (2005)	1 month post	N=800	10.6%	19.5%		5.8%						
India	Flooding Orissa 1994	Kar et al. (2006)		N=45	6.6%	33%				6.6%		46.7%		
India	Super cyclone Orissa	Kar et al. (2004)		N=540	44.3%	52.7%							57.5%	
India	Super-cyclone Orissa (1999)	Kar and Bastia. (2006)	12 months	N=108	26.9%	17.6%								
India	Super-cyclone Orissa (1999)	Kar et al. (2007)	12 months	N=447 7-17 years	30.6%		SI 4.9%							
India	Super cyclone Orissa	Suar et al. (2002); Suar and Khuntia (2004); Suar (2004); Suar et al. (2007)	3 months post	N=135	50%									
India	Kosi River (2008)	Telles et al. (2009) & Telles et al. (2010)	1 month post	N=1,289	n.a.	n.a.								
Myanmar	Cyclone Nagnis (2008)	Kim et al (2010)	1 month post	N=2,575	5.4%				2.2%					
Nicaragua	Hurricane Mitch (1998)	Caldra et al (2001)	Wave 1: 6 months post	N=496	Range 0.4-5.9% (three sites)		8.5%							
Nicaragua	Hurricane Mitch (1998)		Wave 2: 12 months post	N=23 (case follow-up)	50% of Wave 1 cases		Not checked							
Nicaragua	Hurricane Mitch (1998)		6 months post	Posoltega N=52	90%	81%								
Nicaragua	Hurricane Mitch (1998)	Goenjian et al. (2001) (Children)		Chinandega N=55	55%	51%								
Nicaragua	Hurricane Mitch (1998)			Leon N=51	14%	8%								
Sri Lanka	'78 cyclone (1978)	Patrik and Patrick (1981)	12 months post	Paddirupu (affected) N= 61 Thirukovil (control) N=92		41%	SI 41%	3%					84%	
Thailand	Hat Yai Floods (2000)	Assanangkornchai et al. (2004)	2 ½ months post	N=590										40%
Thailand	Hat Yai Floods (2000)	Assanangkornchai et al. (2007)	1 year	N=400										16.5%
Vietnam	Typhoon Xangsane (2006)	Amstadter et al. (2009) Acierno et al. (2009)	Wave 1 immediately pre-flood Wave 2 2-2 ½ months post onset	N=798	2.6%	5.9%					9.3%		2.2%	





**Table 2 : Mental Health Following Floods in Countries of High Human Development**

Country	Disaster	Study	Time after onset	Sample size	PTSD	Depression	Suicide/ Suicide Ideation (SI)	Addictive disorders (alcohol)	Acute Stress Disorder	Acute Psychotic Episode	Panic Disorder	Adjustment Disorder	General Anxiety Disorder	Mental health problem GHQ 12
Mexico	Hurricane Paulina (1997)	Norris et al. (2001) & Norris et al. (2002)	6 months	N=200	Men 14.4% Women 43% 29%									
Mexico	Mexican flood (1999)	Norris et al. (2004) & Norris et al. (2005)	Wave 1 6 months	All four waves Villahermosa (V) N=385	V=12% T=33%		V=6.5% T=14.8% (SI)							
			Wave 2 12 months	Tezuitián (T) N=176	V=8% T=19%									
			Wave 3 18 months		V=8% T=19%									
			Wave 4 24 months		V=14% T=46%									
Poland	Opole (1997)	Norris et al. (2002)	12 months	N=285										
Poland	South West Poland	Bokszczanin (2007)	28 months	N=533	18%									
Venezuela	Vargas state floods (1999)	Otero & Njenga (2006)	18 months	N=5,000	62%									

## Post Traumatic Stress Disorder

As already mentioned and as is clear from Table 1, PTSD is by far the most studied disorder which is not surprising given the nature of the disasters investigated. The diagnosis continues to be highly contentious and the criteria are in the process of revision for DSM-V due to be published in 2013 (for an update of the controversy see Rosen and Frueh (2010)). Apart from the studies by Kohn et al. (2005) (Honduras), Amstadter et al. (2009) (Vietnam) and Otero and Njenga (2006) (Venezuela), the studies reviewed here are not diagnostic on DSM-IV criteria.

The range of PTSD prevalence varies considerably even amongst diagnostic studies of which at the top end we find Venezuela (62%) and at the bottom end Vietnam (2.6%). Predictive factors include: Exposure (Caldera et al., 2001; Goenjian et al., 2001; Suar et al., 2002; Norris et al., 2004; Kohn et al., 2005; Liu et al., 2006; Kar et al., 2007; Abuaku et al., 2009), gender (Caldera et al., 2001; Kohn et al., 2005; Liu et al., 2006; Bokszczanin, 2007; Abuaku et al., 2009; Kim et al., 2010), age (Norris et al., 2002b; Suar, 2004; Liu et al., 2006; Bokszczanin, 2007; Telles et al., 2010), educational level (Suar and Khuntia, 2004; Abuaku et al., 2009; Caldera et al., 2001), flood type (Liu et al., 2006; Abuaku et al., 2009), social support (Norris et al. 2005; Feng et al., 2007), previous mental health problems (Caldera et al., 2001; Amestadtler et al. (2009), family size (Suar and Khuntia, 2004; Abuaku et al., 2009), families with PTSD (effect on children) (Huang, 2010), low caste (Suar and Khuntia,

2004), culture (Norris et al., 2001; Norris et al., 2002a) and externality of survivors (Suar and Khuntia, 2004).

## Depression

Five studies concerned major depressive disorders or depression. Norris et al. (2004) found that first time MDD after six months following the 1999 Mexican floods varied from 2.1% to 4.5% depending on location. Twenty five per cent of adults who had PTSD also had MDD. In Honduras, 19.5% suffered from MDD compared with 10.6% PTSD. The range varied from 24.4% in the high impact neighborhoods to 14.9% in the low impact area. Rates also varied in relation to Social and Economic Status (SES) with the highest rates occurring in the lowest SES group (25.9%), followed by the highest SES group (15.6%) with the middle SES group having the lowest rates (11.0%). In Vietnam 5.9% were found to have MDD which was twice as many as PTSD (2.6%). Risk factors included exposure, prior caseness, and previous traumatic experience. In India, Telles et al. (2009 and 2010) found higher depression increased in relation to age in Bihar and the same tendency was found by Suar et al. (2007) in Orissa. Suar et al. (2002) found that the mean depression rate for the most affected area was 20.11 (SD 3.72) while the equivalent data for the unaffected area was Mean 18.72 (SD 2.57). Support received ameliorated depression. Patrick and Patrick (1981) found 41% to have symptoms of depression in the Sri Lankan case. Otero and Njenga (2006) state that depression rates were checked in Venezuela but unfortunately they are not provided.

## Suicide

Caldera et al. (2001) found a suicide ideation rate of 8.5% with illiterates (OD 2.84 95% CI 1.12-4.37) and those with pre-flood mental health problems (OR 2.84; 95% CI=1.12-4.57) being most at risk. A further paper raises the question of flooding's effect on suicide rates in China. He (1997) maintains that the major difference between the Yangse Basin and other areas of China is the existence of extensive flooding and suggests that the extremely high rates of suicide in the basin, 40% higher than the rest of China, are the result of those floods. Hunan province has a rate which is 173% higher than the national average. Abuaka et al. (2009) studying morbidity and mortality after the 1998 Hunan floods, found 11 cases of suicide (0.3%) out of 40,028 people that had been affected by the floods, this refutes He's hypothesis. If anything, this may suggest that the suicide rate had decreased. Following super-cyclone Orissa (India), Kar et al. (2004) found that 12 times as many people felt that their lives were not worth living after the cyclone than before, a 9.76 times increase in suicide ideation, 7.1 in suicidal plan and 9.7 in suicidal attempts. In all 12% of the population studied had attempted to commit suicide. A study amongst children in the same area found a suicide ideation rate of 4.7% (Kar et al., 2007). Patrick and Patrick (1981) found 15% suicide ideation following cyclone '78 in Sri Lanka.

## General Anxiety Disorder

Three studies included General Anxiety Disorder, in Vietnam, pre-typhoon caseness and exposure were predicative of GAD (Amestadtler et al., 2009), in India following super-cyclone Orissa found a rate of 12% of school children in their middle teens (Kar et al., 2004). Patrick and Patrick (1981) found a level of 84% having symptoms of anxiety.

## Others

Other disorders received attention in just one or two studies. Alcohol consumption is the only addictive disorder that has been studied. There was a 5.8% alcohol abuse rate in Honduras and a 3% rate in Sri Lanka. Acute Stress Disorder was found among 2.2% in Myanmar, 46.7% of respondents showed symptoms of adjustment disorder in Orissa (N=45), Durkin et al. (1993) examined behavioral disorders among children and found that aggressive behavior increased from zero to 10% and that 34% developed enuresis. Disaster

syndrome is no longer examined as a category, but Patrick and Patrick (1981) found symptoms of that categorization including apathy, aimless wondering, mute and motionless behavior among 23% of the population affected by cyclone '78.

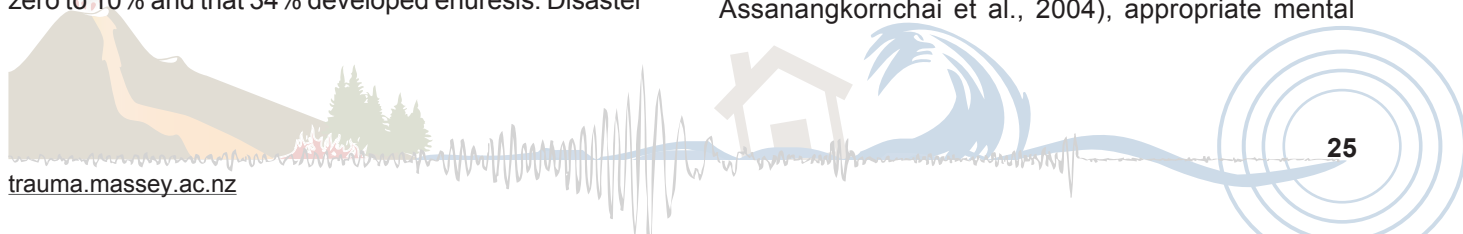
## Longitudinal studies

Assanangkornchai et al. (2007) undertook a longitudinal study using the General Health Questionnaire 12 (a screening test for common disorders) to explore adverse stress reactions following the 2000 flooding in Hat Yai city, Thailand. Four areas were chosen, three reflected different socio-economic status within the city, whereas the fourth was rural. The first study was carried out 10 weeks after the flood and thereafter at eight to ten week intervals, thus giving an unusual temporal dimension to the study (by the fifth study N=400). The data suggests a general remittance followed by an anniversary effect in which the number of symptoms increased in the rural area, which is flooded annually, and in the semi-slum area, but not in the two wealthier districts. The authors concluded that socio-economic status and impact were the most important factors.

Norris et al. (2004) carried out a four wave (six month intervals) study of PTSD in Tezuilán and Villahermosa following Mexico's 1999 flood. At Wave 1 46% of the victims at Tezuilán met PTSD criteria and 14% in Villahermosa (less hard hit). The rates decreased to 19% in Tezuilán and 8% in Villahermosa by the end of the study (2 years). Both studies show that although symptoms decline there are substantial long term consequences.

## Recommendations for response and risk reduction

The epidemiological studies provide crucial information relating to disaster response and disaster risk reduction. All studies show the importance of mental health problems be they at clinical or sub-clinical levels. They show, even if there are considerable difference, that there are substantial problems in all countries and cultures studied. Thus all studies recommend interventions. Specific recommendations are also made relating to particular aspects: social support (Norris et al., 2002a; Feng et al., (2007), paying particular attention to vulnerable groups (Kar et al., 2004; Suar and Khuntina, 2004; Caldera et al., 2001; Assanangkornchai et al., 2004), appropriate mental



health interventions (Suar et al., 2002), yoga (Telles et al., 2010), psychosocial interventions (Kim et al., 2010), develop mental health programs (Kar et al., 2007). Some authors suggest a diversity of interventions depending on context (Norris et al., 2004; Otero and Njenga, 2006). The longitudinal evidence suggests that while symptoms decline of themselves over time, there can be, even after two years, substantial problems requiring long term interventions.

## Discussion

Any criticism of epidemiological studies of disasters should bear in mind that they may be undertaken under extremely difficult conditions and that there is little likelihood of being able to carry out the perfect study. It is far from clear that post-disaster populations want to answer long questionnaires relating to many predictive factors that we find important, and mental health issues may not be the main aim of those undertaking the studies (e.g. Kim, 2010). Thus the information gained from individual studies is often limited. Baseline information is often missing so it is impossible to infer the actual increase in mental health problems following a flood. The location of the study may depend on features such as accessibility which may mean that those worst affected are not included. This may be significant as degree of exposure is an important predictor. Such disasters often cover large areas and affect large numbers of people. The studies of the Hunan floods are exceptional in terms of sample size. Although the number of studies may seem high, the actual information we have is very little. The studies cover a few events in a few countries and cultures. Many of them are small in relation to the numbers affected by the events.

This literature review is limited to peer reviewed epidemiological studies in English. Kim et al. (2010) state their finding of 9% of the population they studied (2,641) following cyclone Nargis had mental health problems was markedly below the 23% found by the (non-peer reviewed) study published by the World Health Organisation (WHO, 2008). However, as the 23% was amongst households (WHO, 2008), the actual figure is unclear as we do not know household size or the actual number of people who had psychological problems within each household, and there is no breakdown in terms of the type of problem. Interestingly the Report found a variation from 6% to 51% depending on location. This huge difference raises the unanswerable question

as to what the effects of location have on the results presented in Tables 1 and 2.

The issue of diagnosis is also problematic. The fourth version of the Diagnostic and Statistical Manual (DSM-IV) of the American Psychiatric Association which provides the basis for many of the epidemiological studies reviewed here introduced the "clinical significance criterion" which states that to be diagnosed, the symptoms of a disorder must cause "clinically significant distress or impairment of social, occupational, or other areas of functioning" (Spitzer and Wakefield, 1999, p 1857). The idea behind the criterion was that "false positives" should be eliminated, having all the symptoms on a list relating to a specific disorder was deemed inadequate as a normal response to an abnormal situation may mean that someone may have the symptoms without having a disorder *per se*. There is a lack of clarity about what the clinical significance criterion actually means, but if it entails that a clinician is needed to make a diagnosis, then epidemiological studies carried out by non-clinicians, as most of the studies reviewed here are, cannot be considered to be diagnostic (Spitzer and Wakefield, 1999). In other words *we do not know how valid the findings are in terms of clinical diagnosis*, as Norris et al. (2002b: 171) state:

"It must be remembered that a diagnosis of PTSD requires functional impairment as well as presence of symptoms. Although the former can never be assumed to be synonymous with the latter, this may be especially true in the context of cultures that encourage expression of distress. Pathologizing what may be a normal response to extreme stress is inappropriate."

However, the alternatives seem to be that either one gives up undertaking such epidemiological studies, especially in developing countries where there are insufficient numbers of clinicians to undertake them (WHO, 2005) and have no information, or, as studies do, point to the limitations and state that the results are only *indicative*, and hope that others do not take them to be true diagnoses when data is used in a different context and where all the data limitations reported in the original article are not repeated.

A further complication is that different studies use different criteria from the same disorder. An example of the problem comes from one comparative study concerning PTSD in which a target population was categorized using both the World Health Organisation's



International Classification of Mental and Behavioural Disorders 10th revision: Diagnostic Criteria for Research (ICD-10-DCR) and DSM-IV criteria found a discrepancy of 4% with the ICD-10-DCR schedule categorizing 7% of the target population as having PTSD and the DSM-IV diagnostic schedule finding just 3%. Forty eight per cent of the difference was due to the clinical significance criterion. The authors' conclusion was that "ICD 10-DCR PTSD cannot be assumed to be identical to DSM-IV PTSD" (Peters et al., 1999, p, 335). Furthermore, the quality of screening tests varies substantially, ranging from Norris et al. (2004) who used the WHO's translation of Module K of Version 2.1 of the Composite International Diagnostic Interview (CIDI), which had previously used in Mexico to Tells et al. (2009) who used the Screening Questionnaire for Disaster Mental Health developed for a Japanese context and which, as they point out, had not been validated on an Indian population.

Of all studies, the Venezuelan case found by far the highest percentage of PTSD, and was diagnostic (Otero and Njenga, 2006). It took place as part of a community response to the 1999 Vargas flooding disaster. It included mass media and community campaigns (supported by *Pfizer*) were used to convey the message that PTSD was a normal reaction to an abnormal condition (contrast with Norris above). Thus it was hoped to de-stigmatize the condition. Several secondary stressors were present – separation of family members, drug and alcohol abuse and movement from one camp to another. Furthermore, people were still living in the affected area. This suggests that either the campaigns led to people over emphasizing the severity of their symptoms and clinicians are making mistakes, or that people covered in other studies are possibly unwilling to report theirs and thus the data are underestimates. These possibilities certainly deserve further investigation.

Sample size varies considerably. However, small studies can be important, Kar et al. (2002) is the only study to include Acute Psychotic Episodes (6.6%) and Adjustment disorders (46.7%). While these figures might be misleading, they do suggest an avenue for further research which is not captured by larger studies.

Different studies take different factors into consideration. To this extent, what is found depends on what is being investigated. In India, for example, only Suar and Khuntia (2004) considered caste, so it is only they who had a chance to find it significant. In addition, studies

often only consider the flood to be the stressor. This means that we know too little about secondary stressors and the impact they might have though the literature sometimes points to them as possible risk factors (Kohn et al., 2005; Otero and Njenga, 2006). The analysis itself is also important. For example, in their initial regression analysis Kohn et al. (2005) found female gender to be of significance (one of the most common findings), but not on their backward regression.

Studies differ on how relevant they find different categorizations in specific cultural contexts (Amestadtler et al., 2009), and as to what influence culture has on responses. Are men just as traumatized as women, but unwilling to talk about it (Norris, 2001)? Much points towards sensitivity to context and culture as being decisive. All studies agree that mental health interventions are important in the wake of floods which implies preparedness. The importance of social support is suggested directly, and also indirectly in terms of support for particularly vulnerable groups and the use of psychosocial interventions. These may be particularly important given the lack of mental health systems.

## Conclusion

This review found 34 epidemiological studies of the mental health consequences of flooding in developing countries. On a general level we can say that all studies show that there are serious mental health problems following flooding events and this gives us good grounds to mainstream mental health issues in disaster response. We can also expect this burden to increase as a result of climate change. This review studied developing countries. The results show that there is no clear relationship between a countries degree of development and mental health outcomes at the national level. However, within countries the relationship to poverty is unclear as the data is missing. The diversity of results suggests that culture and context are of great importance. However, it must be said that too few cases have been studied, too few disorders investigated, and too few variables have been analyzed to make many strong claims beyond these generalizations. All aspects deserve further research.

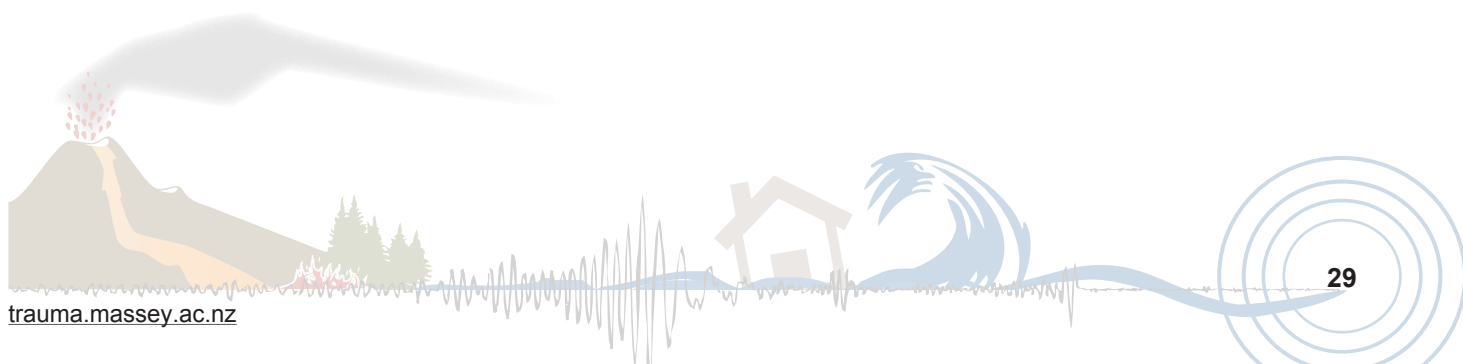
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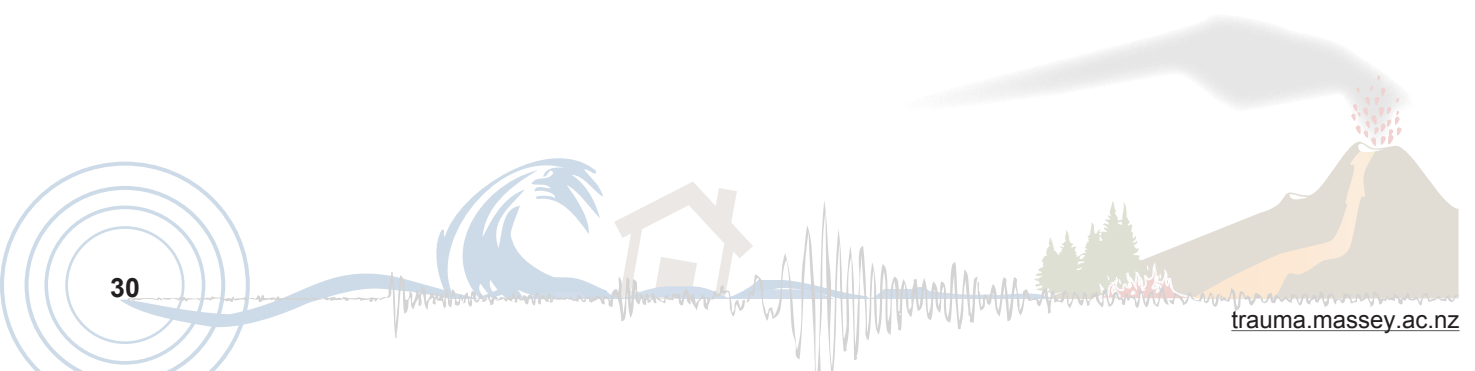
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# Psychiatric Comorbidity in Amputees With Average Sociodemographic Status and the Role of Theologic and Family Support In A Conflict Zone

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## Abstract

**Aim:** The present study is aimed at assessing the various socio demographic variables of amputees in a conflict zone of South Asia with regard to psychiatric comorbidities in a productive age group.

**Materials and methods:** A cohort of 100 amputees diagnosed and identified as per DSM-IV lead criteria for psychiatric comorbidity were included in the study. The data was categorized according to age, sex, residential address, socioeconomic status, education etc. Data obtained from the interview of the subjects was analyzed and simple percentages were obtained.

**Results:** Maximum number of amputee patients 63% (n=63) had major depressive disorder (MDD) followed by Post Traumatic Stress Disorder (PTSD) 20% (n=20), impulse control disorder 19% (n=19), phantom limb phenomenon 14% (n=14), GAD 10% (n=10), panic disorder 6% (n=6) and sub syndromal PTSD 4% (n=4). 16% (n=16) were patients having no psychiatric comorbidity. The comorbidity was present in 58% cases.

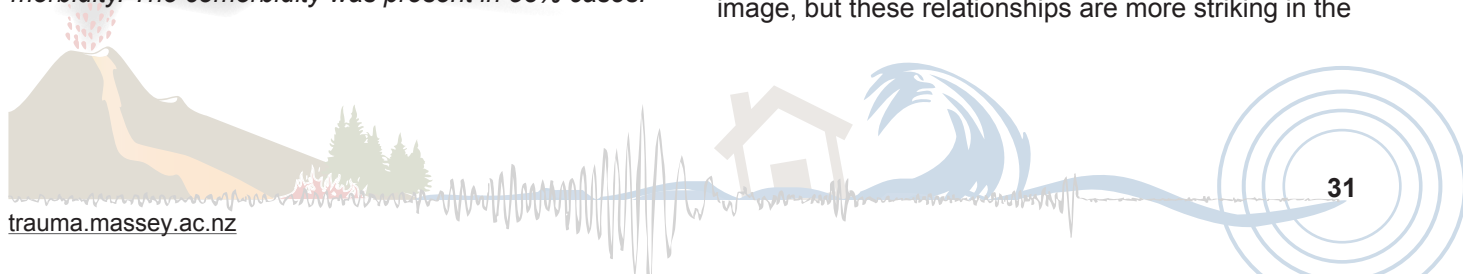
**Conclusion:** Major depressive disorder was the most common comorbidity followed by anxiety disorders in which PTSD subjects were majority followed by impulse control disorder and phantom phenomenon respectively. A significant number were having no symptoms of psychiatric illness in them. This subgroup is significant as they can provide an insight into defense mechanisms which promote healthy recovery and prevent chronic debilitating course associated with amputation.

**Keywords:** Amputee; PTSD; Comorbidity; Theology; Defense

All authors declare that there are no financial contributions to the work being reported or any potential conflicts of interest.

## Introduction:

The association of amputation with profound psychiatric comorbidity is well documented (Shukla et al., 1982, Kashani et al., 1983, Randall, Ewalt & Blair, 1945) some of which include major depressive disorder, Post Traumatic Stress Disorder (PTSD), impulse control disorder, phantom limb phenomenon, generalized anxiety disorder, panic disorder, syndromal PTSD and subsyndromal PTSD. Each disorder requires a different approach to treatment. This is more relevant in conflict and combat zones due to the higher incidence of firearm and road traffic accident related injuries in such areas where normal law and order authorities are rendered ineffective. In such cases, post operative rehabilitation, both physical and psychological, is the most important aspect of reintegration (English, 1989) and presents the greatest challenge to the patient, the family and the amputation team. It calls for a flexible approach addressed to the rapidly evolving needs of the amputee. Initially, the patient is concerned about safety, pain, and disfigurement. Later on, the emphasis shifts to social reintegration and vocational adjustment. Individuals suffering traumatic limb loss at any age are likely to suffer subsequent difficulties with their body image, but these relationships are more striking in the



younger age groups who have experienced traumatic injuries. Older adults may not experience as extreme a reaction as younger adults because the amputation and resultant undesirable change in body image in the latter are complicated by uncomfortable prostheses which are perceived as relatively "on all the time" (Durance & O'Shea, 1988). The period between the surgery and the start of rehabilitation may last a matter of hours or days, depending, among other things, on the reason for the amputation, the extent and condition of the residual limb, and the kind of rehabilitation thought to be feasible. Psychological reactions noted in this phase are concerns about safety; fear of complications and pain, and in some instances, loss of alertness and orientation (Durance & O'Shea, 1988). In general, those who sustain the amputation after a period of preparation react more positively than do those who sustain it after trauma or accident since they are mentally ready to accept the loss of limb and the resultant changes to their activities of daily living. Most individuals are, to a certain degree, "numbed," partly as a result of the anesthesia and partly as a way of handling the trauma of loss. For those who have suffered considerable pain before the surgery, the amputation may bring much-needed relief. By all accounts, the amputee's return home can be a particularly taxing period because of loss of the familiar surroundings of the hospital and attenuation of the guidance and support provided by the rehabilitation team. Hence, the attitude of the family becomes a major determinant of the amputee's adaptation. Family members should be involved in all phases of the rehabilitative process. It is during this phase that the full impact of the loss becomes evident. A number of individuals experience a "second realization," with attendant sadness and grief. Some resent any pressure put upon them to resume normal functioning. Others may go to the other extreme and vehemently reject any suggestion that they might be disabled or require help in any way. An excessive show of sympathy generally fosters the notion that one is to be pitied. In this phase, three areas of concern come to the fore: return to gainful employment, social acceptance, and sexual adjustment. Of immense value in all of these matters is the availability of a relative or a significant other who can provide support without damaging self-esteem. A subtle but often overlooked issue is the ease with which the disability can be concealed in social settings which often determines the social reintegration of the patient. The investigation of psycho-social adaptation to amputation has generated

plethora of clinical and empirical studies (Bradway *et al.*, 1984). Amputation typically is equated with loss of one's perception of wholeness (Parkes, 1972), loss of spouse (Block & Ventura, 1963), symbolic castration (Block & Ventura, 1963) and even death (Goldberg, 1984). The individual response to a traumatic event is influenced by personality traits, psychiatric pre-morbidity, gender, peritraumatic dissociation, prolonged disability of traumatic events, lack of social support and inadequate coping strategies (Schnyder *et al.*, 2001, Scragg, Jones & Fauvel, 2001, Richter *et al.*, 2000, Pajonk *et al.*, 2002). Amputated victims are prone to PTSD symptom (Cheung, Alvaro & Colotla, 2003). Severity of the PTSD symptoms and its progression depends on multiple factors including personality traits (for example neuroticism) level of physical function in secondary stress (for example work related stress due to amputation). The phantom limb phenomenon characteristically occurs after amputation of limbs and other body parts. The intensity, persistence and extent of distribution of phantom limb sensations and the motility of phantom limb itself is directly proportionate to the patients' anxieties (Frederiks, 1963, Melzack & Loeser, 1978).

To the best of our knowledge there has been very less published or detailed studies on stress related disorders available so far from south Asia and the psychiatric co morbidity in the victims of amputation has not been reported so far. The paucity of the literature related to such a study and shortcomings have been time and again discussed both nationally and internationally.

In view of dearth of studies in the field and especially due to prevailing stressful conditions for the masses in general in Kashmir valley, owing to sociopolitical disturbances the study of amputation and its co morbid psychiatric conditions seems crucial for better understanding of the phenomenology of stress related disorders. Such a study seems justified for more than one reason, as the present state of affairs is in sharp contrast to the traditional circumstances that people of valley used to live in. The people are uncertain about future with a constant fear on their psyche in sharp contrast to old days when people used to roam freely, fearlessly celebrate different festivals with joy and fervor. This is borne out by the exponential increase in the number of patients seeking psychiatric help in the last two decades since the armed insurgency began. There is a profusion of different types of hitherto unexplored psychiatric comorbidities in amputees in this part of the

world that need proper evaluation and quantification so that early and effective therapy can be instituted to give some solace to an already battered population which, in effect, is the purpose of this study. We believe that the same principles apply to patients in conflict zones elsewhere and nowadays there is no dearth of such areas in the world.

## Materials and methods

A total of 100 patients were studied. Sample comprised of 100 consecutive cases of amputation. Patients of amputation were identified and diagnosed according to DSM-IV (Diagnostic and statistical manual of mental disorders. 4thEd. APA, 1994) lead criteria for psychiatric co morbidity after discussing with consultant. After consent was obtained from each participant, a detailed history was taken and a general physical examination performed, so as to identify any existing medical problems.

A detailed semi structured interview with all relevant items from MINI (Sheehan et al., 1998) (mini international neuro psychiatric interview) was administered to all the cases included in the study. It follows DSM-IV & ICD-10 criteria for psychiatric disorder. The cases were selected on the basis of the following inclusion criteria:

- i. Informed consent obtained from the patients under study
- ii. Amputation occurred at least one year prior to study
- iii. Participant age more than 14 years and less than 60 years
- iv. An absence of disabling medical or neurological conditions.
- v. No history of DSM-IV axis I or axis II disorder prior to amputation

The data was categorized according to age, sex, residential address, socioeconomic status, education, marital status, occupation, indication for amputation, psychiatric comorbidity and addiction. Data obtained from the interview of the subjects was analyzed and simple percentages were obtained.

## Discussion

Following amputation individuals are likely to experience number of difficulties that may potentially be ameliorated by health, social and rehabilitation services. The primary difficulties experienced by this population are reduced mobility and pain. However this group may also experience psychosocial difficulties. Reduced

mobility varies depending on the quality and fit of the prosthetic limb and the extent to which it is used (Desmond & MacLachlan, 2006). During cultural and social upheavals including manmade environmental factors like war and violence, drastic change takes place in people's expectations, "the meaning of life" and values. The culture buffers its members from the impact of stressful experience by means of social support it provides, providing identities and supplying a shared vision of life. Trauma alters the basic perception not only of the individual but of the whole socio cultural society and may never be the same again. In this study, the various parameters which were used to evaluate the results have been elaborated in tables 1 and 2.

Majority of cases from younger age group (15-30) was on the basis that younger people are physically more active due to economic reasons. Also, youth in conflict zones are known to have higher exposure to the violence as compared to older people. The advent of militancy in Kashmir led to a "Che Guevara" like effect where youth romanticized the gun and took to violence. Another reason could be younger patients are readily seeking help for their psychological problems than older people. In Iran, from amputees of the Iran-Iraq war, Ebrahimzadeh and Fattahi (2004) and from India, Shukla et al (1982) in their study of amputees also reported that the commonest age group involved was 10-30 years.

Most of the patients seen were males (79%). This may be due to the fact that ours is a patriarchal type of society and the males in search of livelihood and doing manual labor (as in this study) are more prone to mishaps both natural and manmade. Shukla et al (1982) in their study of 72 amputees reported a male to female ratio of 17:1 showing the clear male preponderance. Similar findings have also been reported by Cavanaugh et al (2006) where they reported 75% of patients were male.

A majority of our sample was of adults in the culturally marriageable age group in our part of country. This is more pertinent in the rural milieu of Kashmir where marriages are conducted earlier (Margoob, Firdosi et al., 2006).

In our study majority (81%) of our cases were from rural areas and only 19% from urban areas. The reasons for this difference could be that majority of the population is from the rural milieu (Margoob, 1996) where less emphasis is laid on traffic rules or occupational safety. Also, violent incidents quite frequently take place in rural



areas which have less presence of the security forces, terrain more suited to guerilla warfare and implantation of land mines which accidentally take toll of civilian population of that area as well.

In our study majority (64%) of our cases belong to lower class followed by 36% from middle class with no patient from upper class. The reason for this could be that majority of the patients seeking facilities like prosthesis or limb replacement belong to lower class as the consultation services are free of cost with added incentive in the form of monetary aid from the government for such victims. The total absence of any case from upper class does not specify immunity to development of psychiatric comorbidity in that group.

The reasons for such a finding in our study could be that patients from upper class feel stigmatized to be seen in such government centers and prefer to get treated in advanced centers outside the valley of Kashmir, away from the gaze of the common man. Such cases are seen occasionally in private centers but they are loath to take part in any study. Also, much of the elite class of the Vale of Kashmir migrated early on during the inception of militancy to other parts of India and abroad to insure themselves from the goings on. The findings of our study are consistent with other studies conducted in Kashmir and elsewhere in India where it was found that majority of cases were from lower socio economic background (Shukla *et al*, 1982, Wani & Margoob, 2006).

**Table 1:** Demographic data of the study

<b>Participant demographic data</b>	<b>n (%)</b>	<b>Comments</b>
Age range		Nearly half of the cohort was in the age group of 15-30 years.
15-30 years	45 (45%)	
31-45 years	30 (30%)	
46-60 years	25 (25%)	
Sex		More than three fourths of the patients were males.
Male	79 (79%)	
Female	21 (21%)	
Socio-economic profile		Two thirds of the cases were from the lower class and the rest from the middle class; no patient belonged to the upper class.(depending on education, occupation and income of the chief earner of the household)
Lower class	64 (64%)	
Middle class	36 (36%)	
Upper class	0 (0%)	
Education		Nearly two thirds of the sample was illiterate.
Illiterate	61 (61%)	
Literate	39 (39%)	
Marital status		More than half the cases were married.
Married	55 (55%)	
Unmarried	45 (45%)	
Residence		Predominantly rural population.
Rural	81 (81%)	
Urban	19 (19%)	
Addiction		Mostly nicotine.
Nicotine	20 (20%)	
Other	0 (0%)	
Occupation		Mostly household work or manual labor.
Domestic workers	42 (42%)	
Unskilled laborers	19 (19%)	
Students	17 (17%)	
Businessmen	16 (16%)	
Govt. employees	06 (06%)	
Religion		Predominantly Islam.
Islam	95 (95%)	
Sikhism	03 (3%)	
Hinduism	02 (2%)	
Indication/cause		Half of the cases were due to road traffic accidents and the rest due to firearm injuries of various types, fall from height and machinery injuries.
Vehicle Accident	53 (53%)	
Blast	11 (11%)	
Land mine	06 (6%)	
Fire arm injury	04 (4%)	
Others	26 (26%)	

**Table 2:** Psychiatric comorbidity

Comorbidity	Number(n)	Percentage
Major depressive disorder	63 (n=63)	63%
Post traumatic stress disorder	20 (n=20)	20%
Impulse control disorder	19 (n=19)	19%
Phantom limb phenomenon	14 (n=14)	14%
Generalized anxiety disorder (GAD)	10 (n=10)	10%
Panic disorder	06 (n=06)	06%
Sub syndromal PTSD	04 (n=04)	04%
None	16 (n=16)	16%

Maximum number of amputee patients 63% (n=63) had major depressive disorder (MDD) followed by Post Traumatic Stress Disorder (PTSD) 20% (n=20), impulse control disorder 19% (n=19), phantom limb phenomenon 14% (n=14), Generalized anxiety disorder (GAD) 10% (n=10), panic disorder 6% (n=6) and sub syndromal PTSD 4% (n=4). 16% cases (n=16) had no psychiatric comorbidity. The comorbidity was present in 58%.

Most of the people who visit government hospitals of our valley for free treatment are illiterates from very poor background where it is very difficult for people to achieve and afford formal education. The other reason could be that, as per census of India (2001), Jammu and Kashmir (J&K) is one of the states of India where literacy rates are low (54.46%) than average in India (65.38%).

In our study the largest group of participants (42%) were either doing house hold work or were house wives, as females form 21% of our study. This is in keeping with cultural and social background of our state as majority of women look after their house activities rather than working outside. Another reason could be because of poverty and non affordability of going to school plus in general lack of employment policy in our state which is corroborated by the fact that out of total 25.2% working force in Jammu & Kashmir, only 41.3% males and 7.3% females are gainfully engaged as main workers while 63.4% are not working resulting in poor socio economic conditions (Census of India, 2001).

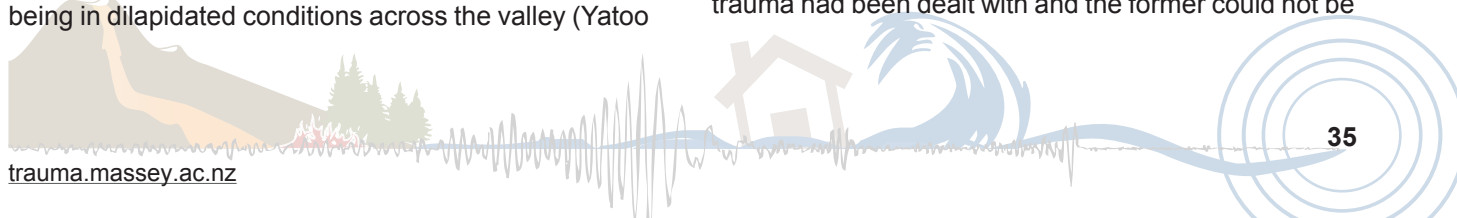
Kashmir is overwhelmingly inhabited by Muslims and other communities like Hinduism, Sikhism form part of minority (Census of India, 2001), hence the 95% incidence of Muslims in this study. The greater percentage of Muslims is also due to mass exodus of minorities in early nineties with start of armed conflict in Kashmir whereby non Muslims migrated amass to different parts of India.

In our study, motor vehicle accident account for majority (53%) of amputations. This could be because of overwhelming increase of traffic on the roads with road being in dilapidated conditions across the valley (Yatoo

& Tabish, 2008). The facts are further substantiated by lawlessness and violence in valley which attribute to reckless driving and negligence of law enforcement agencies. The other collective percentage of 21% which includes 11% for blast injuries, 6% for land mine explosions and 4% for fire arm injury is significant by all means because of violent sociopolitical disturbance in Kashmir since 20 years. This is further aggravated by cross border shelling of neighboring country which sometimes hit the civilian population and may lead invariably to amputation. The above findings are in accordance with high prevalence of traumatic events in Kashmir as depicted by Margoob, Firdosi et al in a study in 2006 which reveals that 59.51% of adult men and 57.39% of women have lifetime prevalence of exposure to traumatic events.

In our study 20% of the patients were addicted to nicotine which is more than the incidence (15%) in the general population (Census of India, 2001). The reason for addiction could be that amputation brings about drastic life changes and requires major occupational, social and emotional adjustments. The reliable information about the harder substances was not revealed by the subjects in most of the cases. As it is a well known phenomenon that drug dependent subjects do not reveal the true information as is also reflected in one of the earlier studies in Kashmir by Margoob et al (2004) where it's reported 61.91% of suspected substance abusers deny any history of abuse at first contact with the investigating team. Garafalo (2000) in his study reported that readjusting to life after amputation is likely to be challenging for most people as a result a multitude of problems, including mal addicting coping behavior (drug /alcohol consumption) are present. Similar findings are reflected in other study by Kashani et al (1983) where they reported increased prevalence of addiction in amputation because of confounding trauma of amputation and comorbid depression.

Psychiatric co morbidity was not diagnosed initially in most of the cases as they were being dealt with for their orthopedic problems in an orthopedic hospital with no counseling facilities or any form of psychiatric help. It was only after the patients had been discharged from the orthopedic center that they slowly started consulting the psychiatric hospital for management of PTSD and related symptoms. This often happened after the treating orthopedic surgeon or family members felt the need to address their psychological trauma after the physical trauma had been dealt with and the former could not be



treated satisfactorily at the primary level. More the delay in referral, more severe were the symptoms. Better results were seen with patients who received early and vigorous physical and psychological rehabilitation. The psychiatric comorbidities encountered included the following:

### **Major Depressive Disorder**

In our study we found that 63% of patients were suffering from major depressive disorder. This was diagnosed by DSM-IV based mini interviewing adult version (Sheehan *et al.*, 1998). It formed the most common co morbid psychiatric condition in our study. Shukla *et al* (1982) in reported depression was the commonest presentation in 70.2% of 72 amputees. Kashani *et al* (1983) reported a 35% prevalence of major depressive disorders in 65 amputees evaluated in physical medicine and rehabilitation center. Similar findings have also been reported by Randall *et al* (1945) where they observed major depressive disorder to be the most common prevalent psychiatric co morbidity as a result of amputation. Kashif *et al* (2004) in their study of 40 patients with lower limb amputation also showed depression as highly prevalent in amputee population.

### **Anxiety Disorders**

40% of patients were suffering from anxiety disorders which included 20% as PTSD, 4% as subsyndromal PTSD, 10% as GAD and 6% as panic disorder. The higher prevalence of PTSD in our study could be because of higher rate of PTSD in this part of the world (Margoob, Firdosi *et al.*, 2006). Fukunishi *et al* (1996) who conducted a study on 26 patients with digital amputation reported PTSD rate of 33.9%. In a study conducted by Grieger *et al* (2006) to find the prevalence of PTSD and depression in battle injured soldiers reported that 12.2% patients had PTSD at 7 months. The findings of our study are in disagreement with those conducted by Cavanagh *et al* (2006) where they reported the rate of PTSD was relatively low after amputation. The reason for disagreement could be reflected by the fact that the sample size in the above mentioned study was small only 26 patients were studied and the other reason could be that the reason of amputation was therapeutic. Studies by Schubert *et al* (1992), Frierson and Lippmann (1987) and Thompson and Haren (1983) reported significant level of anxiety among amputees in their respective studies. Cavanagh *et al* (2006) in their study found PTSD in only three of their twenty six subjects. However twenty three of them

were therapeutic amputations only three were accident related amputations. In these three two had PTSD and one rated high on Clinician-Administered PTSD Scale (CAPS). This again proves greater PTSD is present in trauma related amputation cases.

### **Impulse Control Disorder**

19 % of patients in our study reported impulse control disorder in the form of crying spells and outburst of anger. Similar findings were reported by Shukla *et al* (1982).

### **Phantom Limb Phenomenon**

Lacroix *et al* (1992) in a study of 100 cases of upper extremity amputees of the Sierra Leone civil war 1990-1994 reported that 90% had phantom sensation and 29% had phantom pain. However, in our study the lower prevalence of phantom phenomenon (14%) could be attributed to the fact that the time duration since amputation was variable and usually of longer duration. As mentioned earlier, these amputees sought professional psychiatric help long after the initial trauma, by which time the phantom phenomenon had subsided considerably. Our observation is further substantiated by Melzack (1990), and Sherman *et al* (1980) who in their respective studies reported that phantom limb sensation and pain gradually decreases with time.

### **None (no psychiatric co morbidity)**

In our study 16% of the patients reported to have no psychiatric co morbidity. This could be due to various coping strategies adopted by the patients with primarily religious and spiritual involvement and obedience to local clergy and spiritual healers (Huda & Margoob (2006). Most of these patients were living in joint families with good family support that included spouses, parents, siblings and other near relations. Spiritual belief showed up as a positive factor in positive coping wherein the patients were more religious than before the trauma and were visiting the local clergy and mosques much more frequently. They were also trying to keep busy with their vocations and theology. Their families were also treating them like before and did not at any point of time let them feel different than previously. These people were also visiting the shrines of various Sufi saints and ascetics to achieve salvation and inner peace of mind. This observation is in agreement with the observation reported by Margoob, Khan *et al* (2006) in one year long longitudinal study of snow storm disaster survivors in Kashmir. The study reports that disasters adversely

affect and overwhelm stress coping mechanism of survivors. Appropriate psychological support by family, close friends and counselors can enhance the capacity to resolve problems, which is achieved by helping survivors to get back their cognitive skills which are of immense help in preventing future psychopathology and its disability. Spirituality is a strong tool to reinforce resilience among the survivors and cope with various difficulties in course of trauma. Pertinently, the eastern religions teach inevitability of fate which helps survivors to accept and live beyond trauma. Similar studies from Kashmir and Chechnya (Margoob, Firdosi et al., 2006, Huda & Margoob, 2006, Jong et al., 2004) reveal that resorting to religion happens to be most often used coping method for dealing with problems and intense emotions of trauma in our society. Further observations have also proved decrease in stress related response by above said measures in a study from Israel by Foa (2006). Spiritual involvement in the survivors of Waltengu, a Himalayan Village 60 kilometers south of Kashmir, which suffered extensive damage and loss of lives due to a snow storm in south Kashmir in 2005 also involved attachment to, and obedience of local clergy and spiritual leaders. Our study is further substantiated by study of Huda and Margoob (2006) in which they have reported that integrated spiritual components as an integral part of the psychosocial intervention was rewarding in the management of many patients with severe post disaster psychopathology. Drescher and Foy (1995) observed in their study that spiritual beliefs and practices along with social, emotional, physical and cognitive aspects are getting included in the current concepts of coping strategies. Further Russell D' Souza and Bruce Singh (2005) who in their study on post tsunami in Sri Lanka observed that the role of religion spirituality and rituals help to enhance resilience, coping understanding the meaning of trauma in a correct perspective.

## Conclusion

Comorbidity was very common in amputees in our study. Most of the patient were of younger age group, were males, married and belonged to lower socioeconomic class with majority from rural areas. Majority of the sample comprised of unemployed doing household work and were illiterate. Major depressive disorder was the most common comorbidity followed by anxiety disorders in which PTSD subjects were majority followed by impulse control disorder and phantom phenomenon

respectively. GAD and panic disorders were also reported by the patients though their percentage was less. A significant number of patient reported addiction to nicotine post amputation. It was almost exclusively seen in males. Most of the patients in our sample had duration of amputation running over years and came late to seek counseling. The ones who resorted to psychiatric help early on had better outcome of their comorbidity. A good number were having no symptoms of psychiatric illness in them. These were the ones who benefited most by strong family support and recourse to religious reawakening, accepted their disability with fortitude and moved on in life.

In light of above observations of our study, awareness about the co-morbid psychiatric disorders in amputation patients can be very helpful in diagnosing and proper treatment of such cases and further to prevent chronic debilitating course associated with amputation. More intensive physical and psychiatric rehabilitation with attention to the provision of prosthesis, retraining, and financial support packages will improve the quality of life of these patients. In a close knit society like ours, with a tightly woven social fabric, the support of family members is invaluable to enable the amputee to overcome his physical and mental disability and lead a healthy, productive life. Guidance of local clergy and recourse to religion can accelerate this healing process and the same ought to be encouraged at all levels of treatment.

There are some limitations of this study. The DSM-IV is designed by the American Psychiatric Association and its application in a population in Kashmir which is predominantly illiterate may confound results. However, in the absence of a suitable alternative more relevant to our local populace, we are compelled to use the DSM-IV criteria. Since such a study has not been previously performed in Kashmir and there is a dearth of studies on stress related disorders available so far from south Asia, the DSM-IV has not been validated in our population. This is an attempt to use the DSM IV criteria as a tool for assessing psychiatric morbidity.

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