

Monitoring injury in the New Zealand adventure tourism sector: an operator survey

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Abstract

Background: Client safety is a major risk management concern for the commercial adventure tourism sector in New Zealand. This study built on previous exploratory analyses of New Zealand adventure tourism safety, including industry surveys conducted by these authors in 1999 and 2003. The aims of the study were to provide a continuation of injury monitoring across the sector through data collected from self-reported injury incidence by industry operators, and to compare findings with those from other primary and secondary research studies conducted by the authors.

Method: A postal questionnaire was used to survey all identifiable New Zealand adventure tourism operators during 2006. The questionnaire asked respondents about their recorded client injury experience, perceptions of client injury risk factors, and safety management practices.

Results: Some 21 adventure tourism activities were represented among the responding sample (n=127), with most operations being very small in terms of staff numbers, although responding operators catered for nearly one million clients in total annually. Highest ranked risk factors for client injury included clients not following instructions, level of client skill, ability and fitness, and changeable/unpredictable weather conditions. Highest client injury was reported for horse riding, eco-tourism and white water rafting sectors, although serious under-reporting of minor injuries was evidenced across the sector. Slips, trips and falls were the most frequently reported injury mechanism, while safety management measures were inconsistently applied across the sector.

Conclusions: The industry should address reporting culture issues and safety management practices generally. Specifically, the industry should consider risk management that focuses on minor (e.g. falls) as well as catastrophic events.

Health and safety issues associated with tourism and adventure activities continue to attract interest from researchers from diverse disciplines ^{1,2}. One area of tourist activity that has received only limited attention, largely in the New Zealand and Australian context, is the burgeoning adventure tourism sector. No international destination is as closely associated with adventure tourism activity as New Zealand. Of the approximately 2.2 million visitors to New Zealand annually, a large proportion participate in some form of adventure tourism. For example, jet boating alone services between 200,000 and 250,000 overseas visitors annually. The New Zealand adventure tourism industry is extremely broad in scope and covers a wide range of activities ranging from passive to highly active and soft to hard ³ in terms of degree of effort and risk to safety. Figure 1 provides a breakdown of what is now an established definition of the scope of activities within adventure tourism used in numerous studies internationally, organised under overlapping land, water and air-based environments.

Figure 1 about here

Client safety is a major risk management concern for the adventure tourism sector in New Zealand and internationally ^{4,6}, but it is a double edged sword: if you manage all of the risk and adventure out from the experience, it will cease to be attractive and exciting. Indeed, research with adventure tourism participants in New Zealand's self-acclaimed 'adventure tourism capital' of Queenstown has found that those

engaging in adventure tourism activities in this destination seek the experience of risk or 'perceived risk' from their participation in commercial adventure activities, although actual risk and an uncertain outcome are not a driver for participation ⁷. Therefore, safety management has a key role to play in managing the level of risk which is appropriate to the type of activity involved and the ability level of the participant(s).

Despite its well-marketed clean, green, and safe image, New Zealand has not been without its share of serious incidents involving international visitors. Indeed, a number of early studies into adventure tourism safety in New Zealand provided evidence that some New Zealand adventure activities, notably white water rafting, scenic flights and mountain recreation, were associated with serious and fatal injury to overseas visitors and domestic recreationalists ⁸⁻¹¹.

The research reported here builds upon a series of studies over the past decade that have sought to understand the extent of the adventure tourism safety problem in New Zealand ^{4,12-17}, and identify areas of risk associated with activities, clients, environments and organisation that contribute to client injuries. The monitoring of adventure tourism safety in New Zealand has been examined through exploratory analysis of archival data and survey research with the aims of establishing an injury baseline for this sector and identifying key areas of risk across the industry.

Triangulated findings from these studies have indicated that activities such as tramping, mountaineering, snow sports, horse riding, mountain biking and surfing present greatest injury risk in the independent adventure travel sector ¹³ and amongst the New Zealand resident population ¹⁶, while horse riding, mountain biking, and a

number of water-based activities such as rafting and diving are most commonly associated with commercial adventure tourism injuries^{14,17,18} Slips, trips and falls have been found to be the most common injury mechanism across each of these studies, while environmental, client-related risk factors, unfamiliar operating environments, exposure to water/drowning risk, and slipping and tripping hazards are the major risk factors across the different activities in the adventure sector. Finally, the risk and safety management practices of adventure operators have been found in two previous surveys conducted in 1999 and 2003 to be highly variable across the industry, with under-reporting of injury and incidents and inconsistent use of various essential safety management practices.^{15,19}

The present study builds upon the 1999 and 2003 studies on adventure tourism safety in New Zealand, and seeks to provide a continuation of incident monitoring across the sector, while broadening the scope of information collected about operators' safety management practices and their perceptions of risk for the activities provided. It also seeks to triangulate findings from this study with that of previous research as cited above. This information will assist the establishment of priorities for intervention to reduce adventure tourism risk, and identification of client injury control measures currently in place (or absent) in the New Zealand adventure tourism industry, with a view to establishing guidelines for the development of effective adventure tourism safety management.

Method

The construction of a database of all identifiable New Zealand operators within this industry involved an extensive review of different secondary data sources to establish

the precise scope of the sector. The sources of listings used included the NZ Outdoors Magazine directory and various other publications in which operators advertised their businesses. It is recognised that this is only a partial coverage of the total population, since inclusion in such lists is based on a willingness to advertise in these publications. Other listings were obtained from company fliers, other advertising materials, and regional Yellow Pages. The resulting search yielded 460 companies. The initial mail out of 460 businesses was undertaken during December 2006 - the peak summer season, and was followed up one-month later with a reminder to prompt respondents. The survey was addressed to the owner or manager.

The data collection method was a self-completion postal questionnaire, comprising four discrete sections: the business (ownership, staffing, location, size); details of the activity/activities provided commercially and number and nature of clients; a more substantive section on safety management activities of the business (reporting requirements and behaviours, systems in place, factors/barriers preventing total safety for clients); and a final section on injuries and incidents. Respondents were asked to state the number of serious harm, minor injuries and near-miss incidents recorded in their accident register (a legal document for the recording of injury incidents) for the preceding 12-month period. For the purposes of the questionnaire, serious harm injuries were defined as 'fatalities or injuries requiring hospitalisation such as fractures and dislocations, burns, serious lacerations, concussion', minor injuries as 'cuts, bruises or other minor injuries not requiring hospitalisation', and near-miss incidents as 'close call incidents in which an injury might have occurred'. Respondents were also asked about risk factor perceptions for these incidents, and common injury types/mechanisms. The questionnaire was very similar in content to

the research instruments used for the 1999 and 2003 surveys of New Zealand adventure tourism operators, allowing some comparison of findings between the three surveys.

Descriptive analysis of quantitative data was undertaken using SPSS for Windows (version 13), and consisted of frequency distributions and cross-tabulation of categorical data, and calculation of client injury incident rates (per million participation hours) using injury counts and activity participation data provided by the operators. Qualitative data, in the form of operators' perceptions of risk factors was subjected to qualitative content analysis. This involved the sorting of responses into a variety of themes relating to different areas of risk.

Results

Sample characteristics

A total of 127 operators responded to the survey, comprising a response rate of 35%, once business closures, duplications and mega operators such as ski-fields were excluded (n=101). This outcome is similar to that achieved in the 1999 and 2003 surveys and is typical of small business surveys of this nature which rarely achieve in excess of 40% response rates.

The study sample was representative of the total population of operators in each region (as established in the operator database discussed above) plus or minus <10 %. This is a very successful survey outcome, and illustrates a wide geographical coverage as well as a good representation across the main tourist route through New Zealand's

two islands. Thus, the major adventure tourism centres of Queenstown and the Otago region (n=38); Canterbury, and in particular, Christchurch (n=25); Rotorua and the Central North Island (n=13); Nelson and Marlborough (n=12); and the West Coast (n=10) were well represented among businesses surveyed.

The dominant pattern of ownership was either jointly owned (50%) or sole ownership (38%). The majority of respondents described themselves either as the owner (48%) or manager (26%). In terms of the length of operation, 6% had been in business for two years or less, 18% for five years or less, and 53% for 10 years or less. Businesses surveyed were mostly very small, with a mean of just 11 staff per business (SD= 22.2), with some 40% of businesses being employing just one or two staff or guides (usually the owners). Almost one in two staff/guides employed by adventure tourism businesses worked on a seasonal or temporary basis (46%).

Adventure activity and client distributions

Surveyed operators predominantly provided land-based (33%), water-borne (28%), or combined land and water-based (27%) activities. A further 11% offered aviation-based activities. The 21 activity sectors included in the survey represents a wide range of adventure experiences, including activities from right across the 'soft'/'hard', 'passive'/'active' activity continuums. The most common activities surveyed were: eco tourism (20%), horse riding (12%), sea kayaking (9%), multi-adventure (9%), diving (7%) and tramping (6%).

Activities had a medium duration of six hours, with 8% of activities taking one hour or less to complete, including travel to and from the activity site, and 49% less than

five hours to participate. Operators reported 936,226 clients during the 12-month period, January-December 2005, with the number of clients ranging from 10 to 142,000. Approximately one-half (49%) of adventure tourism clients during the period of the analysis were estimated to be male, and just 11% children under the age of 16. Some 62% of clients were reported to be overseas visitors.

Perceived risk factors for client injuries

Operators were asked to rank the top five factors that act as barriers to providing total client safety from a list of factors generated largely from the findings of the 1999 and 2003 surveys of New Zealand adventure tourism operators. Table 1 provides a summary of the most common responses to this question, organised under the sub-system categories: client and activity factors, environment factors, and work organisational and management. Summary examples of typical supporting comments of respondents are also shown.

Table 1 about here

In line with the previous surveys of New Zealand adventure tourism operators, weather conditions, exposure to water/drowning risk and slipping and tripping hazards were frequently selected as threats to client safety. Highest rankings were given for client factors, with clients not following instructions, client knowledge, skills and abilities, and unfamiliarity with task and environment strong themes in responses.

While operators mainly focused on clients and their behaviour as key areas of risk, as might be predicted from conventional models of accident causation that focus on

behaviour and the individual, it is interesting to note that some respondents also recognised the role of weaknesses in work organisation and aspects of management in client safety. The most important of these appear to be related to staff experience and quality and equipment provision. These findings differ markedly to those of the 2003 survey, however, where respondents identified considerably more organisational and management issues as risk factors.

Injury event types (mechanism of injury)

Respondents were asked to select types of injury event that occur most commonly in actual injuries involving their clients. The main injury event types (mechanism of injury) experienced by clients, are shown in Table 2, along with activities most often reporting each type of injury event.

Table 2 about here

In line with previous surveys and analyses of archival injury data^{13,16}, the most frequently reported events were ‘underfoot incidents’, with slips, trips and falls (STF) (45%) and stepping on/in or twisting ankle injuries (29%) the most commonly noted event types. Activities for which underfoot incidents were most commonly reported as a threat included eco tourism, tramping, and multi-activity operations.

The majority of horse riding operators reported falls from a height to be a common injury event for their clients, while water-borne activities frequently selected striking against an object – not surprisingly when such activities often involve white water and/or moving at speed close to river banks, rocks and other obstacles. Indeed,

respondents comments to an open question on risk suggested that rafting and jet boating participants are exposed to some risk from colliding with a rock or other hard object when moving at speed along a river.

Client injury experience

To obtain a measure of self-reported client injury among New Zealand operators, respondents were asked to record the number of injuries from their accident book in the 12 month period, January – December, 2005. Some 115 businesses responded to this question (12 operators declined to provide this information). A total of 459 injury incidents were recorded, of which 54 (12%) were serious harm incidents (requiring hospitalisation, fractures, serious lacerations or burns, near-drowning or fatality) at an average of 0.5 serious harm incidents per operator. A further 1100 near-miss events were reported, at an average of approximately 10 per operator (SD= 54.7). Some 69% of businesses recorded no serious harm injuries, and 44% reported no minor injuries. Reporting rates were very similar to those of the 1999 survey, where 142 operators reported 379 client injuries, although the 2003 survey had a large number of snow sports injuries (n=756) bringing the total to 1095.

Client injury frequency, the ratio of minor/serious injuries, and client injury incidence *Per Million Participation Hours* (PMPH) by activity sector are shown in Table 3.

Client injury incidence PMPH was calculated from annual client numbers and activity duration information provided by operators to allow meaningful risk comparisons between different activities, in terms of accounting for the duration of client exposure to the activity. Activities that have been consistently found to involve high counts and/or incidence of hospitalisation¹³ and/or injury compensation claims^{16,17} in

previous research by these authors are highlighted (shaded) in Table 3 for comparison with the current dataset.

Table 3 about here

What is clear from Table 3 is that, with the exception of eco tourism, horse riding, and rafting, the first two of which are regarded as ‘soft’ adventure recreation, the industry reports very few client injuries. Indeed, a number of activity sectors, mountaineering, canyoning and paragliding/parasailing, reported zero injuries or incidents for the period of the analysis, while several other sectors reported less than five injuries. This was also the case for near-miss reporting, with only rafting and eco tourism recording notable quantities of events.

Serious harm injuries were concentrated around just a few activities, notably eco tourism, tramping, rafting and horse riding, with most of these activities found to involve high levels of injury in previous research. White water rafting operators reported a high level of client injuries, reflecting the hazardous nature of this ‘hard’ adventure activity. It should be noted, however, that rafting operators had a relatively high minor/serious harm injury ratio, which suggests a culture where injuries are routinely recorded. Indeed, rafting operators reported large numbers of near-miss events. Sea kayaking and eco tourism operators surveyed also appear to have good reporting systems, although the reverse was observed for tramping and snow sports, where a very low minor/serious harm ratio was observed.

The analysis also considered the relationship between a range of business-related variables and reported client injury numbers. Of these, the only variable found to have a significant relationship with number of injuries reported was size of operation (based on number of staff group) ($H(2)=17.2$, $P=.000$), probably reflecting the fact that larger organisations have more clients at risk of injury. Older businesses reported more injuries, in line with previous surveys, with those in operation for 16 years or longer reporting some 57% of injuries, but represented just 32% of the sample. This finding is likely to be influenced by the fact that older businesses tend to be larger, and therefore service more clients. Finally, the analysis considered the reporting of injuries by region. Highest levels of reporting were observed for West Coast operators, who reported 20% of all injuries, but represented just 8% of the sample. Businesses located in the Otago region, including those in the self-proclaimed ‘adventure capital of the world’, Queenstown, also reported relatively high rates of injury, being responsible for some 35% of all injuries, but comprising only 28% of the sample.

Safety management activities of businesses surveyed

Respondents provided information on measures or systems they had in place to manage safety and reduce the risk of injuries to clients. Operators were asked whether they were required to report serious harm client injuries to any government authority or industry body. A little over one-half of respondents noted they report to a specific body, not including mandatory notification to the Department of Labour (DOL) or Accident Compensation Corporation (ACC), while a further 37% reported only DOL and ACC. Nearly 8% did not report serious client injuries to any regulatory body or industry organisation, while 2% did not know.

Respondents were also asked to indicate the type of injuries and incidents that were formally investigated by their business. The majority of respondents (76%) reported that all accidents, incidents and near-miss events were investigated, and a further 13% investigated all accidents resulting in injury. Of concern were the 11% who either investigated serious harm injuries only or undertook no investigations at all.

A formal risk management plan was reportedly in place at 92% of operations surveyed, while nearly one-half of businesses did not undertake or have in place all of the following basic safety management activities: accident/incident investigation and analysis; hazard identification and control; safety audits or reviews; staff/guide safety training; safety communications/information for participants/clients; regular maintenance checks on plant, vehicles and equipment; formal emergency procedures. Some 32% of operators did not have two or more of these activities in place, while information for participants was the specific activity most often not in place.

Respondents' comments to an open question asking for details of safety activities or systems they used focused most frequently around secondary and tertiary aspects of safety, rather than measures to prevent injury. The most commonly reported of these were: communication devices and measures to help locate individuals and/or get help to injured persons; waivers to protect the business from lawsuits from injured clients; first aid training and equipment; and rescue equipment.

Discussion

The study has provided further evidence for several key areas of concern for client safety, previously identified in the 1999 and 2003 surveys of New Zealand adventure

tourism operators, and through analyses of archival injury data. While it is probable that some businesses manage client safety extremely effectively, particularly in the case of highly controlled activities such as bungee jumping, sky diving and underwater diving operations, this alone does not explain the low level of reporting of client injuries by respondents. A 'reporting culture' is one of Reason's²⁰ four key areas that make up an informed culture or safety culture, and is widely recognised as being a vital component for high-performance safety cultures. Many businesses surveyed reported zero or very few client incidents and injuries during the one-year period of the analysis, including minor injuries and near-miss events, suggesting a poor culture for injury recording, and making effective injury monitoring across the industry very difficult. Fortunately, findings from this analysis can be triangulated with those from analysis of secondary data to provide a clearer picture of the extent of adventure tourism injury, although the current situation remains highly unsatisfactory and should be focus of further investigation.

Turning to those activity sectors with greatest apparent risk to client safety, highest injury counts and client injury incidence rates (with the exception of indoor climbing, for which only one company was surveyed) were observed for horse riding operations. These findings are in line with those from analysis of hospitalisations of overseas visitors to New Zealand¹³, and more recently, ACC claims data^{16,17}, where 3810 injury claims and three fatalities were attributed to horse riding during the one-year period, July 2004-June 2005. These findings suggest preventive efforts should start with this activity and focus on female riders who are over-represented in horse riding injuries. Further epidemiological support for the problem of equestrian safety in New Zealand can also be found in a recent study of injury compensation claims²¹.

White water rafting was another activity for which a relatively high injury count and incident rate was observed. This popular activity involves a high-level of active participation by clients, and rivers range from moving water with small waves (level 1) to extreme, violent rapids (level V). Risks of serious injury can result from being thrown out of the boat and exposed to hazards such as drowning, exposure to extremely cold water, and pinning or striking against underwater rocks. Indeed, compensation figures showed there were two fatalities involving rafting over a 12-month period¹⁶. Operators in this sector of the industry are covered by regulations (Rule 80 of the Maritime Safety Act) governing their activities in New Zealand, and research suggest most rafting operations have effective management systems.

Findings in relation to key risk factors for adventure tourism injury, once again pointed to the risk to clients from fall hazards and to the prevalence of underfoot injuries. Previous research has indicated that walking on a sloped and often wet and muddy surface (e.g. a river bank or mountain footpath) carrying a backpack, kayak or some other load is the major source of STF risk in this industry¹⁴. It is also apparent from respondents' comments to this and previous surveys that some clients, particularly those inexperienced in New Zealand conditions and the activities they were participating in, wore footwear and other apparel unsuitable for the activity. Better choice of walking track or route to activities and route risk assessments may reduce these risks, as might provision of suitable footwear for clients.

Environmental factors, particularly fast changing weather and water conditions, and challenging wilderness and mountain terrain, were the major risk factors for client injuries identified by respondents. Client factors such as ignoring instructions, not

understanding briefings due to language difficulties, and unfamiliarity with the unique New Zealand environment, further increase the risk of injuries in these hazardous environments. Active, close supervision of novice clients and clients with poor English understanding or activity skills, together with smaller client/guide ratios, are important requirements where clients are exposed to hazardous or unfamiliar tasks and/or environments ²². In line with previous surveys ¹⁹, this study has found adventure operators report difficulty recruiting staff with the necessary experience and quality, with an emphasis on the need for depth of guide experience, rather than qualifications alone. The seasonal nature of this workforce, with many potential staff working in other sectors off-season, further exacerbates this problem.

Further insight was provided by the study into the safety and risk management practices of New Zealand operators. The major finding was that operators' injury prevention initiatives were highly varied across the industry, with a notable proportion of respondents not applying some basic safety management activities. Happily, the proportion of operators reporting the use of formal risk assessment/risk management procedures was significantly higher than for previous surveys, suggesting improvements in this area over recent years. However, the quality of risk management practice may be considerably variable across the sector; an issue that should be explored in future research, given the growing evidence in New Zealand that the 'No-Fault' Accident Compensation culture is being challenged in the courts and leaving adventure tourism operators more liable to legal action through negligent behaviour. ²³

A departure from previous surveys was the relatively large proportion of businesses not reporting the use of pre-activity instructions and information for clients as a safety measure. Communication strategies using a range of media and languages is considered vital where clients may be disinclined to follow instructions, distracted by the thrill or excitement associated with the activity, or speakers of foreign languages, perhaps with different cultural norms and expectations¹⁸. Communication strategies adventure operators use for the purpose of primary, secondary and tertiary safety should be investigated through further research.

Previous studies¹⁹ have indicated that costs and time resources were the most important barriers to operators' safety efforts, particularly for smaller operations. Much of the industry is comprised of small concerns with one or two owner/operators undertaking a range of management functions, the overwhelming focus of which is likely to be operational matters. It is probable that many small operations would benefit greatly from some assistance in setting up effective safety management/risk management systems, and some form of mentoring in this area. In this respect, it is likely that sector associations that promote codes of conduct (e.g. SKOANZ) would be important in efforts to disseminate best practice in safety management, along with environmental behaviour.

An important limitation of the study is the rate of response to the survey, with just over one-third of those surveyed participating in the study. This finding reflects the small business nature of respondents, the time of year the survey was administered (the peak summer season), and the potentially sensitive nature of questions relating to injuries to clients. The findings reported here should therefore be treated with some

caution as the possibility of respondent bias (e.g. more safety-aware operators may have responded) is greater with small samples such as this, and generalisation to the wider industry (external validity) is more problematic. However, many of the key findings reported here correspond closely to those of the 1999 survey which achieved a response rate of 42%, and other studies reported in this paper. Future research should, therefore, focus on activities identified here and in previous archival and survey studies as carrying greatest client injury risk, including horse riding, mountain biking, rafting and a range of other marine and mountain-based activities. Multidisciplinary research should also focus on operators' risk management practices across the adventure sector³, and developing best practice standards for improving client safety across the New Zealand adventure tourism industry.

Acknowledgements:

The authors wish to thank New Zealand adventure tourism operators and their employees who gave of their time to participate in this survey.

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Figures and Tables

Figure 1. The New Zealand adventure tourism sector

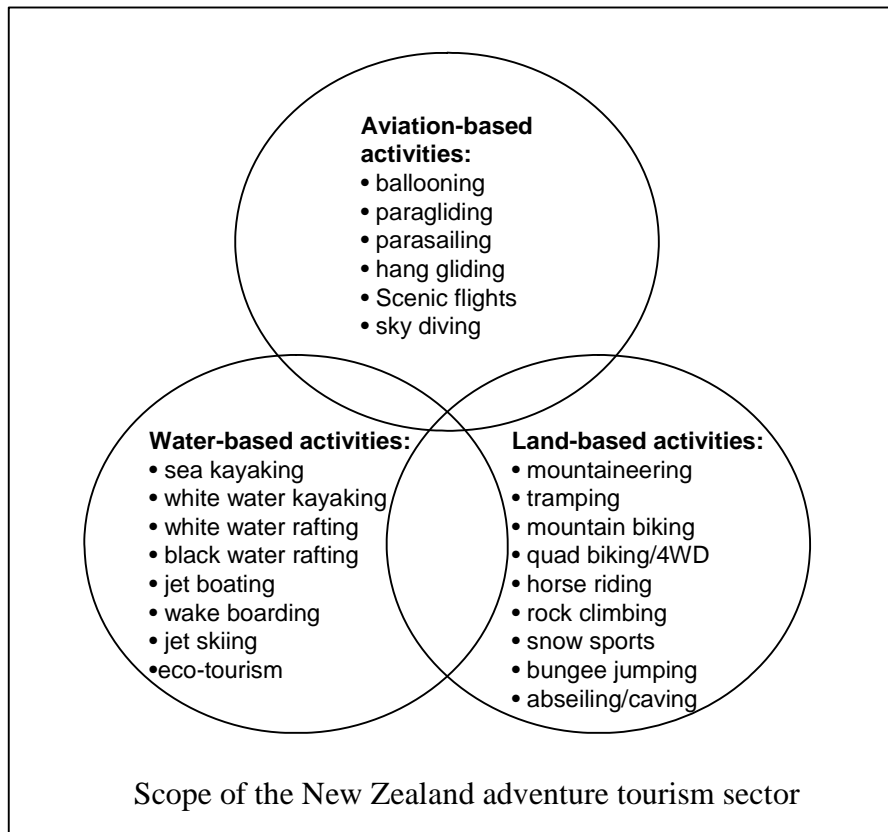


Table 1. Most commonly selected perceived risk factors for adventure tourism operations and comments supporting selections

Risk factor	Respondents selecting as one of five main risk factors (n)	(%)	Comments on nature of risk factors and potential impact on client safety*
<i>Client and activity factors</i>			
Clients not following instructions	85	67	They may not be able to respond appropriately in a critical situation; may not realise actual risk involved, not a passive activity, skill required
Horseplay/showing-off	26	20	Difficult to provide safety to clients who move outside parameters of safety/leave route/take risks
Client knowledge, skills and abilities	58	46	Problems arise when these are poorly matched to the activity; clients over-reaching beyond their ability level
Client fitness level	42	33	Mismatches arise if not considered in selecting level of difficulty; clients may not declare ill-health
Client unfamiliarity with the activity	28	22	As for client knowledge, skills and ability above
Client unfamiliarity with environment	51	40	Conditions can surprise clients - particularly in marine settings
Language/cultural factors	23	18	Misunderstanding instructions – critical where things go wrong
<i>Environmental factors</i>			
Weather conditions/changes	60	47	Can get caught out by changeable weather – if not prepared for anything
Wilderness/unfamiliar environments	36	28	As with weather conditions – need to be adequately prepared/attired
Slipping/tripping hazards	42	33	Walking on wet, sloped, unstable, frozen/snow surfaces; moving too fast for conditions on foot or other
Exposure to water/drowning risk	27	21	Falling out of raft/vessel; crossing rivers, diving incidents, high water levels; cold water
<i>Organisational factors</i>			
Staff experience/quality	17	13	Lack of experienced guides reduces quality of safety practices – don't have adequate depth of knowledge
Organisational communication failures	4	3	In situations where clients don't understand instructions; between guides and management – increases risk exposure of clients
Client/guide ratio	4	3	Difficult to lead group with too many clients to guides – especially where group inexperienced
Equipment usage/failure/maintenance	16	13	Increased risk to clients where equipment is marginal, ill-fitting, poorly maintained, absent
Inadequate safety/risk management	8	6	Unidentified hazards, risk levels too great for level of client ability, lack of control of hazards/risk factors

*note: these comments have been summarised from various narrative responses provided in questionnaires

Table 2. Distribution of injury initiating events and activities most frequently reporting them

Injury initiating event (IIE)	n	(%)	Activities most frequently reporting IIE
Slips, trips and falls on the level	57	45	eco tourism; tramping; multi-adventure; diving; kayaking; scenic flights
Foot or ankle injury due to treading on something or twisting	37	29	eco tourism; skydiving; tramping; multi-adventure
Striking against an object	34	27	jet boating; scenic flights; white water rafting; black water rafting
Falls from a height	20	16	horse riding; tramping; mountaineering
Exposure to heat or cold	17	13	kayaking; diving; white water rafting
Injured by animal	11	9	horse riding; diving
Struck by an object	9	7	mountaineering; horse riding; bungy
Drowning/non-fatal submersion	8	6	mountaineering; bungy; horse riding
Hand or limb caught in machine, object	3	2	bungy; horse riding
Manual handling/lifting or carrying	1	1	diving

Table 3. Distribution of client injuries by activity sector

Activity sector	Cases per activity (n)	Minor injuries (n)	Serious harm injuries (n)	Near-miss events (n)	Ratio of minor/serious injuries	Client injury incidence rate (PMPH)*
Black water rafting	1	21	3	72	7	308
Bungy jumping	2	3	0	4	-	97
Cycle tours/mountain biking	2	6	0	3	-	78
Eco tourism activities	25	87	12	325	7.25	58.5
Education/Personal and social development	4	1	0	1	-	61.5
Horse riding/Pony trekking	15	89	11	52	8.1	822.1
Indoor climbing	1	5	0	0	-	1812
Kayaking/Canoeing	12	32	0	18	-	133.9
Multi-activity	11	14	0	28	-	32.6
Scenic flights	7	6	0	4	-	109.2
Snow sports	4	1	2	4	0.5	2.7
Sky diving	3	0	3	5	-	58.0
Tramping/trekking	8	19	10	52	1.9	66.3
White water rafting	5	86	6	522	14.3	364.2
Hang gliding/paragliding/parasailing	2	0	0	0	-	0
Diving	9	16	4	2	4	53.7
Jet boating	7	9	2	6	4.5	39.1
4 Wheel drive/quad bikes	3	4	1	4	4	42.7
Canyoning	2	0	0	2	-	0
Mountaineering	2	0	0	0	-	0
Other	2	4	0	0	-	-
Total	127	405	54	1100	-	95.6

* per million participation hours

