An economic assessment of the voluntary land search and rescue sector in New Zealand

Scott & Scott report on a research project that investigated and quantified the economic value of the land voluntary search and rescue services to New Zealand.

Abstract

Volunteers are an important part of search and rescue operations in New Zealand but their value to society is not easily quantified. During the year ending June 2007 volunteers were estimated to have contributed $3 million ($579 per volunteer) or 59% of annual land search and rescue costs. If the services of the voluntary land search and rescue sector were not provided, then either this activity would be curtailed and police and /or other public sector, and health and injury costs would rise. An additional $1 million of funding devoted to avoiding the need for search and rescue operations would be justified if 6 incidents were prevented.

Introduction and aims

Volunteers are an integral part of land and inland waterways search and rescue operations in New Zealand. However, because volunteers are in general not paid for their services their value is hidden, not easily quantified and often not recognised by society. The aims of this research were to investigate and quantify the economic value of the land voluntary search and rescue services to New Zealand.

Background and literature review

The value of the total voluntary sector to New Zealand was $3.31 billion or 2.3% of GDP in 2004 (Statistics New Zealand, 2007b). The equivalent contribution to GDP in Canada was 2.6% in 2003 compared with 3.3% in Australia, 2000 (Statistics New Zealand, 2007b). In Australia the imputed value of volunteers' time was reported to be equivalent to the combined total of the labour input of education and health services (Bittman & Fisher, 2006, fig 1 p4), twice that provided by government support (Bittman & Fisher, 2006, fig 2 p6).

It is considered (Summers, 2001) that "Australia would become dysfunctional if it were not for its volunteers". In particular, there is a heavy reliance on its volunteer fire fighters and the need to train, retain and fund them is an important theme in recent Australian literature and submissions. "There is no economically viable alternative to a volunteer mode of service delivery in many areas of the emergency services." (Australasian Fire Authorities Council, 2001,p1). Volunteers are often highly skilled. In Canada trained volunteers are regarded as equally effective "as highly trained paid professionals, and are more readily available." (Royal Canadian Mounted Police, 2007).

In the context of this paper, search and rescue is defined as "…the process of looking for, locating, and retrieving a missing person" (Wellington Land Search and Rescue, 2007). Search and rescue incidents in New Zealand are graded as; Class I involving only the Police, Class II incidents when the Police require assistance, and Class III that involve the activation of Emergency Locator Beacons, missing aircraft and ships at sea (New Zealand Police). At least two Police staff (the emergency call taker and an incident controller) will be involved with any search and rescue incident requiring assistance.

New Zealand Land Search and Rescue (LandSAR) provide land search and rescue advice to the Police and assist in co-ordinating search and rescue activities of volunteers and Police. LandSAR has over 2,500 trained search and rescue volunteers (LandSAR New Zealand, 2007).

Methods and data

Two sets of costs have been calculated; health and injury incident costs, and programme delivery costs. All unit costs are in New Zealand dollars and were the latest available at the time of the study and are net of any government transfer payments. ($NZ1 = $A0.7997 and $US7607, Reserve Bank of New Zealand mid point rates average for June 2008.)

Health and injury incident costs are the costs generated by the incidents that fall upon the health sector, the rescued person and their family, and society at large. For the purposes of this study, we have defined health and injury incident costs as the total of; direct medical costs, direct non-medical costs, indirect costs (productivity costs of those rescued and their family) and intangible costs (quality of life and mortality) (Appendix 1).

Details of land search and rescue incidents (Classes II and III) were obtained from the New Zealand Police (New Zealand Police, 2007c) for the years ending June 2006 and June 2007. Incidents were allocated to each year based on the incident date. Health and injury incident costs were calculated by grading each incident using the health/ injury cost impact scale and multiplying the numbers thus derived by the unit costs of each cost rating category (Appendices 2 and 3).

For each recorded incident a Police researcher classified those rescued using the narrative attached to each incident record and the incident severity scale descriptors (Appendix 2: Incident severity scale (Scott & Scott, 2007)). Where the person was not located a health cost impact rating of zero was given, and all suicide incidents were given a severity grade of 9. The numbers of incidents in each severity grade were totalled and recorded in a spreadsheet. The totals in each incident severity ranking were then used to evaluate total potential health and injury costs (broken out by economic impact rating) by multiplying the numbers in each severity grade by the unit cost of that grade (Scott & Scott, 2007) (Appendix 3).

Programme delivery costs are the administrative overheads of LandSAR and costs incurred by volunteers and by the Police. The opportunity cost to volunteers include work and leisure time activities foregone (productivity costs), transport, and equipment wear and tear. Volunteers' productivity costs were calculated by multiplying volunteer hours by average hourly earnings. The Automobile Association costs for a 1601 – 2000cc petrol motor vehicle travel. It was assumed that an individual volunteer could drive an average of 400km per year although some individuals would drive up to 3,000km per year for operations and training.

Volunteers should have good bushcraft and survival skills in addition to stamina. "First response group members are expected to maintain their skill levels by attending 50% of our training exercises and 50% of SAR call-outs per year. This amounts to 3-4 one-day training courses and 1-2 weekends per year, plus 2-3 days on searches. You should also spend enough time in the hills to maintain your fitness and bushcraft skills" (Wellington Land Search and Rescue, 2007). A skilled searchers' time probably has a higher opportunity cost that of the average New Zealand worker. This was taken into account in the sensitivity analysis.

Based on information from LandSAR (LandSAR New Zealand, 2007) the average number of volunteers in a search and rescue team was 8. However, team numbers vary according to the requirements of the particular operation and numbers have been as high as 200 and as low as one.

Each land search and rescue volunteer is expected to have basic equipment consisting of the usual outdoor clothing (boots, gaiters, parka, over-trousers, gloves and hat), sleeping bag and mat, cooker and utensils, torch, whistle, compass, first aid kit, NZMS 260 series topographic maps and have sufficient food and water for 24 hours. We considered that volunteers' equipment would have a life of only 5 years instead of the gear lasting 10 years under normal use. The annual average cost of equipment was calculated by comparing the difference between discounting the purchase cost over 10 and 5 years and using a discount rate of 5%. Base case purchase costs were retail list prices (Kathmandu, 2007) less 20%. It was considered that the following basic items would not deteriorate and were therefore not included; backpacker stove, utensils (polycarbonate plate, bowl, cup knife, fork, spoon), compact pot set, whistle, and compass.

The economic value of volunteers' contribution to search and rescues may be evaluated in three ways; (1) the opportunity cost to the volunteer, (2) the input cost to the provider if volunteers did not contribute resources (referred to by Bittman and Fisher as "the alternative provider cost method) (Bittman & Fisher, 2006, p5), and (3) the opportunity cost of not providing search and rescue services. We implicitly assumed that method (1) and (2) were equivalent and could be estimated using one set of unit costs. For method (3), if land search and rescues were not provided it could be assumed that the number of incidents resulting in death and injury and the costs generated by such incidents would rise. We did not attempt to estimate the increase in health and injury that would occur if search and rescue services were withdrawn.

Sensitivity analysis (Drummond, 2005, ch9) was conducted to take account of uncertainty in the estimates and measure the impact of changes in the values of determinants on key output variables. Univariate sensitivity analysis was applied by changing one variable at a time while holding all else constant and recording the effect on the outputs of interest. Multivariate sensitivity analysis was not conducted because it was considered that it was more informative to consider the un-confounded effect of key inputs on the outputs of interest.

The following variables were investigated:

Unit cost for incidents resulting in death:
low = half the base case, high = the base case.

Number of searchers per team:
low = 6, base case = 8, high = 10

Hourly earnings of searchers:
low = base case, high = base case multiplied by 2.

Equipment unit costs: The retail list prices less 40% were used as the low bound as city-based outdoor equipment stores in New Zealand may discount prices up to this amount. Many volunteers are not city-based and are unable to take advantage of retail price reductions and volunteers frequently need to replace equipment when it fails thus we used a base case of list prices less 20% and the full retail list price as the high value.

Kilometres travelled by volunteers:
low = 50, base case = 400, high = 3,000.

Appendix 4 provides additional information on data references.

Results

Over the 2 years ending June 2007 the New Zealand Police coordinated an annual average of 714 incidents (seeking 732 people, an average of 1.03 persons per incident). The annual average health and injury costs of these incidents amounted to $116 million, or $163,083 per incident (Table 1). Almost all of this cost was generated from incidents involving deaths.

Table 1. Land search and rescue and the cost of injury and illness.

Health cost impact rating and the effect of illness/injury on the individual		Unit cost for each rating	Persons needing assistance Year ending June Mean 2006–2007		Cost per year	
Rating	Effect on individual rescued	(1) $	(2) N	%	(3)=(1)x(2) $	%
0	None	0	406.0	55.46	0	0.00
1	Minor	9	3.5	0.48	31	0.00
2	Minor	36	12.0	1.64	436	0.00
3	Minor	42	27.0	3.69	1,123	0.00
4	Medium	42	37.5	5.12	1,560	0.00
5	Medium	281	69.0	9.43	19,423	0.02
6	Major	3,598	106.0	14.48	381,369	0.33
7	Major	3,971	24.0	3.28	95,302	0.08
8	Life changing	5,896	6.0	0.82	35,376	0.03
9	Life changing	2,825,000	36.5	4.99	103,112,500	88.62
10	Life changing	2,825,000	4.5	0.61	12,712,500	10.93
Sub total	9 & 10 (deaths)	2,825,000	41.0	5.60	115,825,000	99.54
Total needing assistance and cost			732.0	100.00	116,359,620	100.00
Included in above						
– Suicides (given rating 9)			11.0			
– Not located/recoverable (given rating 0)			17.0			
Total incidents (4)			713.5			
Persons sought per incident			1.03			
Cost per incident					$163,083	

(4) Unit record data sorted on incident date
Because of rounding, the numbers may not add exactly to the totals shown

During the year ending June 2007 LandSAR volunteers contributed 16,924 hours (2.96 per volunteer) to search and rescue incidents (operational hours of LandSAR personnel). Volunteers also incurred transport and equipment costs.

The costs for all volunteers per year was a total of $3.304 million, (time $0.395 million, transport $1.667 million and equipment $1.243 million). For each volunteer these costs amounted to $579 per year (time $69, transport $292 and equipment $218) (Table 2).

Table 2. Volunteer costs annual average of years ending June 2006 and 2007 in 2007/08 prices.

		Per volunteer		Total	
	Unit cost	Volume	Cost (3)=(1)x(2) $	Incidents and volunteers	Cost (4) $
Number of incidents involving LandSAR and Police (5)				713.5	
Number of volunteers (6)				5,708.0	
Time hours (7)	23.32	2.96	69.14		394,668
Transport km (8)	0.73	400	292.00		1,666,736
Outdoor equipment (9)	217.82	1.00	217.82		1,243,294
Total			578.96		3,304,697

Notes
Because of rounding, items may not add exactly to the totals shown
(4) = Cost item per volunteer (column 3) x the number of volunteers (6)
(5) Operations involving LandSAR (mean June 2006 and 2007)
(6) = (4) x 8 volunteers per search team. A volunteer may take part in more than 1 incident per year.
(7) Operational hours, directing, managing incidents (year ending June 2007)
(8) A volunteer was assumed to drive their own motor vehicle 400 km to/from incidents and training @ AA 1601 - 2000cc petrol
(9) 2007 prices. Boots, gaiters, gloves, overpants, jacket, hat, sleeping bag, thermal rest, torch, first aid kit, and pack were assumed to have no residual value after 10 years of recreational use but 5 years for LandSAR volunteers. A discount rate of 5% was used and an annual equivalent cost calculated. Purchase cost was the retail list price less 20%.

Boots	$400	
Gaiters	$48	
Gloves	$6	
Overpants	$336	
Jacket	$520	
Hat	$24`	
Sleeping bag	$416	
Thermal rest	$112	
Torch	$18	
First aid kit	$27	
Pack	$240	
Total cost of outdoor equipment	**$2,147**	
Real interest rate	5%	
Future value	0	
Life - years	10	5
Annual equivalent cost	$278	$496
Difference between discounting over a life of 5 versus 10 years		$218

Table 3. Programme delivery costs year ending June 2007 amounted to $5.580 million.

Cost	$	%
LandSAR central and regional adminstration (1)	968,244	17.4
LandSAR volunteer cost	3,304,697	59.2
Police (2)	1,307,029	23.4
Total	5,579,970	100.00

(1) LandSAR incorporated budget for the year ending June
(2) Land based search and rescues class II and class III combined

Table 4. Key output variables.

Item	Reference	Value
Number of incidents (annual average of years ending June 2006 and 2007	(1)	714.00
Incident health and injury costs (2008 prices, and volumes mean of 2006 and years ending June)	(2)	$116,359,620.00
Programme delivery costs (budget 2008 year ending June)	(3)	$5,579,970.00
Population (100,000, Dec 2007)	(4)	42.396
Number incidents per 100,000 people per year	(5)=(1)/(4)	16.8
Health and injury cost per incident	(6)=(2)/(1)	$163,083.00
Programme delivery cost per incident	(7)=(3)/(1)	7821.00
Number of incidents avoided to breakeven on programme costs	(8)=(3)/(6)	34.00
Increased number of incidents that must be avoided to breakeven on an increase in search and rescue funding of $100,000,000	(9)=1000/(6)	6.1

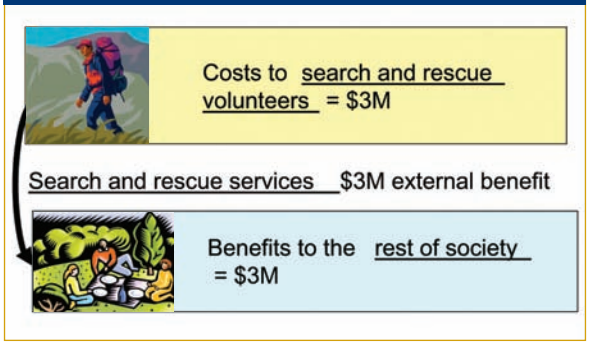
Table 5. Sensitivity analysis.

Output variable	Number of incidents that must be avoided to breakeven on programme delivery cost		Increased number of incidents that must be avoided to breakeven on an increase in search and rescue funding of $100,000,000	
	Change %	Output variable N	Change %	Output variable N
Base case value of output variable		34.2		6.1
Determinant				
Unit costs or volumes of incidents causing death x 0.5	99.1	68.1	99.1	12.2
Number of searchers per team reduced by 25% to 6	-13.0	29.8	–	6.1
Number of searchers per team increased by 25% to 10	13.0	38.7	–	6.1
Hourly earnings of searchers x2	7.1	36.6	–	6.1
Clothing full price (rather than 20% off list price)	5.6	36.1	–	6.1
Clothing list price less 40% (rather than 205 off list price)	-5.6	32.3	–	6.1
Km travelled 50 (rather than 400)	-26.1	25.3	–	6.1
Km travelled 3,000 (rather than 400)	194.2	100.6	–	6.1

There were 714 average annual incidents for the years ending June 2006 and 2007; 16.8 per 100,000 people. The number of incidents that would need to be avoided to breakeven on all programme delivery costs was 34 and the increased number of incidents that would need to be avoided to breakeven on an increase in programme funding of $1 million was 6 (Table 4).

Comprehensive sensitivity analysis (Table 5) showed that the results were robust in response to cost determinants changing within credible ranges. However, if extreme situations were considered; halving the number of incidents causing death, and/or increasing the average number of kilometres to 3,000 that a volunteer drove in a year the results show a dramatic increase.

Figure 1: Social benefits generated by the volunteer search and rescue sector.



Discussion and conclusions

Discussion

The opportunity cost to volunteers is a conservative estimate as the time component of the cost was based on average hourly wage rates which do not adequately reflect volunteers' skills and commitment. In addition, no account was taken of the time spent on training. The business sector (employers and the self-employed)

are also bearing part of this productivity loss to society when they recognize the need for volunteers to take time off when incidents arise. Specialist equipment required for the LandSAR Search Dogs, LandSAR Caving groups, the Alpine Cliff Rescue and the Whitewater groups was not included in the analyses but would be expected to be part of equipment required by volunteers in such teams.

Incidents can arise at any time and the need to ensure that a state of preparedness exists (planning, organisation, and readiness) means that the cost of delivery of such a service as LandSAR is substantial. The human capital embodied in the volunteers enables them to save time and lives in the field through their local knowledge, first aid training and ability to communicate with medical professionals thus limiting the physical deterioration of those rescued.

The value of the contribution of volunteers to search and rescue costs should be recognised and appreciated as volunteers' costs of $3.0 million represent an external benefit to the rest of society (Figure 1).

If the services of the voluntary land search and rescue sector were not provided, then either this activity would be curtailed or police and /or other public sector costs would rise. If LandSAR did not exist (the counterfactual) then there would be no costs incurred by LandSAR administration and volunteers, but it would be reasonable to assume that the number of incidents resulting in death and injury and that the costs generated by such incidents would rise. In addition, valuable experience and knowledge would be lost to search and rescue activities.

Limitations

It was not possible to forecast accurately the increase in severity of health and injury outcomes that would occur if search and rescue activities were scaled back, withdrawn, or to become less effective. Although volunteering improves social capital (a beneficial externality) that enhances the functioning of society it was not possible to quantify this.

Conclusions

Collection and analysis of data on search and rescues should continue. An incident severity score for each person rescued should be recorded and information on the number of volunteers per incident and the private costs of volunteers collected.

Volunteering has the capacity to complement some government services and thus lower the cost from the public purse but volunteers should not be used to replace services that should be supplied by government. The personal cost to a volunteer is an average of $579 per year. If volunteers did not contribute to search and rescue activities then either this activity would be curtailed or police and other public sector costs would rise by at least $3 million per year. The study demonstrates that an additional $1 million of funding devoted to avoiding the need for search and rescue operations would be fully offset by a reduction of 6 incidents.

Appendices

Appendix 1: Health and injury costs, and social and human capital

Direct medical costs of an incident are the opportunity costs of resources directly utilised by treatment and are concerned with services delivered by the health sector.

Direct non-medical costs are directly related to treatment of an incident but the services may not be provided by the health sector. Indirect costs (productivity costs) are the time related costs to the individual arising from the incident as a result of reduced capacity to work or to engage in leisure-time activities. They also include lost production to society through death (if not captured in intangible costs). Intangible costs relate to the loss of life and reduction in quality of life.

Social capital refers to the intangible elements of human relations relating to levels of trust and the quality of social networks. Social capital enhances efficiency in social relations and minimizes transaction costs (Jackman, 2001). Human capital refers to the accumulation of productive skills and technical knowledge of individuals (Spellerberg, 2001, p9).

Appendix 2: Incident severity scale

SEVERITY RANKING	IMPACT ON PARTICIPATION	INJURY	ILLNESS	SOCIAL / PSYCHOLOGICAL DAMAGE
0	NONE	None	None	None
1	MINOR/SHORT TERM IMPACT on individual/s that doesn't have large effect on Participation in activity /programme.	Splinters, insect bites, stings	Minor irritant	Temporary stress or embarrassment
2		Sunburn, scrapes, bruises, minor cuts	Minor cold, infection, mild allergy	Temporary stress or embarrassment with peers
3		Blisters, minor sprain, minor dislocation Cold/heat stress	Minor asthma, cold, upset stomach, etc	Stressed. Beyond comfort level. Shown up in front of group.
4	MEDIUM IMPACT on individual/s that may prevent participation in the activity / programme for a day or two.	Lacerations, frostnip, minor burns, mild concussion mild hypothermia, mild heat stroke	Mild flu, migraine	Stressed, wants to leave activity, a lot of work to bring back in.
5		Sprains & hyper-extensions, minor fracture	Flu, food/hygiene related diarrhoea/ vomiting	Distressed, freezes on activity, requires 'emotional rescue', does not want to participate again.
6	MAJOR IMPACT on individual/s that means they cannot continue with large parts of the activity/ trip/ programme.	Hospital stay < 12 hours, fractures, dislocations, frostbite, major burn, concussion, surgery, breathing difficulties, moderate hypothermia/heat stroke	Medical treatment required, hospital stay < 12 hours eg, serious asthma attack, serious infection, anaphylactic reaction	Very distressed, leaves activity and requires on site counselling, unwilling to participate in activity ever again.
7		Hospital stay > 12 hours eg, arterial bleeding, severe hypothermia/heat stroke , loss of consciousness	Hospital stay > 12 hours eg, infection or illness causing loss of consciousness, serious medical emergency	Therapy/ counselling required by professional
8	LIFE CHANGING effect on individual/s or death.	Major injury requiring hospitalisation eg, spinal damage, head injury	Major illness requiring hospitalisation eg, heart attack	Long term counselling/ therapy required after incident
9		Single death	Single death	Post-traumatic stress disorder, changed profession because of incident,
10		Multiple fatality	Multiple fatality	Suicide because of incident

Note: This table is based on the outdoor incident severity scale developed by the New Zealand Mountain Safety Council and Davidson (New Zealand Mountain Safety Council, 2007), (Davidson, 2004)

Appendix 3: Health and injury costs by impact rating scale 2007

HEALTH COST	IMPACT RATING	Health costs				Unit cost for impact rating (2008 prices)
		Direct medical a $	Direct non medical A b $	Indirect c $	Intangible d $	$
0	No cost					
1	Minor impact	9				9
2		36				36
3		42				42
4	Medium impact	42				42
5		95		187		281
6	Major impact	2,731	494	373		3,598
7		2,731	494	746		3,971
8	Life changing effect	3,536	494	1,866		5,896
9					2,825,000	2,825,000
10					2,825,000	2,825,000

Notes
1a Antiseptic cream (tube)
2a = 1a plus sterile pads (pack), and strapping tape
3a, 4a = 2a plus analgesic (pack)
5a = 4a plus 1 general practitioner consultation after hours
6a, 7a Accident and emergency short stay observation plus 1 general practitioner consultation
6b, 7b, 8b Ambulance callout for an emergency (New Zealand average emergency incident x2)
5c 8 hours, 6c 16 hours, 7c 32 hours, 8c 80 hours, lost productivity @ average total hourly earnings
8a Average of AR DRGs B79Z Skull Fractures, and F70B Major Arrhythmia and Cardiac Arrest W/O
9d, 10d Value of a statistical life

Appendix 4: Data sources

Data item, date of data: source

Ambulance callout for an emergency 2004: (New Zealand Ministry of Health, 2005)

Average hourly earnings, December quarter 2007: (Statistics New Zealand, 2008)

Cost per km, current in 2008: (AA, 2008)

DRG prices 2008 weights, 2004/05: (New Zealand Health Information Service, 2007)

General practitioner fees, 2008: (Southern Cross Medical Care Society, 2008)

Inpatient national price, 2006/07: (New Zealand Health Information Service, 2007)

LandSAR central and regional administration, 2007/08: LandSAR budget

Operational hours LandSAR personnel, 2006/07: (Land Search and Rescue New Zealand, 2007, p10)

Outdoor equipment, 2007: (Kathmandu, 2007)

Police costs in delivering class II and III incident response, 2006/07: (New Zealand Police, 2007b)

Population, October 2007: (Statistics New Zealand, 2007a)

Unit record data relating to incidents occurring during the 2 years ending June 2007 (New Zealand Police, 2007c)

Value of a statistical life, current in 2007: (New Zealand Ministry of Transport, 2004)

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References

AA. (2008). Fuel & car running costs. Retrieved 22 April, 2008, from http://www.aa.co.nz/motoring/owning/running-costs/Pages/default.aspx

Australasian Fire Authorities Council. (2001). An invited submission to the Charities Definition Inquiry from the Australasian Fire Authorities Council on behalf of fire and emergency sevice agencies, *Charities definition Inquiry*. Melbourne.

Bittman, M., & Fisher, K. (2006). *Exploring the economic and social value of present patterns of volunteering in Australia*. Canberra: Department of Families Community Services and Indigenous Affairs.

Davidson, G. (2004). Exploring the myths: Analysis of incidents and accidents in professional outdoor education in New Zealand, 1996 – 2000. *Journal of Adventure Education and Outdoor Learning*, 4(1), 11-35.

Drummond, M. (2005). *Methods for the economic evaluation of health care programmes* (3rd ed.). Oxford: Oxford University Press.

Jackman, W. (2001). Social capital. In *International encyclopedia of the social & behavioural sciences* (pp. 14216-14219): Elsevier Science Ltd. http://www.sciencedirect.com (accessed 27 November 2003).

Kathmandu. (2007). *Summer 07-08*. Christchurch: Kathmandu.

Land Search and Rescue New Zealand. (2007). Annual report 2006-2007. Wellington: Land Search and Rescue New Zealand.

LandSAR New Zealand. (2007). LandSAR New Zealand. Retrieved 26 October, 2007, from http://www.wlsar.org.nz/General/faq.html

New Zealand Health Information Service. (2007). Inpatient national prices. Wellington: New Zealand Health Information Service.

New Zealand Ministry of Health. (2005). Ambulance services sustainable funding review. Retrieved 20 February, 2007, from http://www.moh.govt.nz/moh.nsf

New Zealand Ministry of Transport. (2004). *The social cost of road crashes and injuries: June 2004 update*. Wellington: Ministry of Transport.

New Zealand Mountain Safety Council. (2007). The National Incident Database Project. Retrieved 19 February, 2007, from http://www.incidentreport.org.nz/

New Zealand Police. (2007a, January). New Zealand Police search and rescue. Retrieved 29 October, 2007, from http://www.police.govt.nz/service/sar/

New Zealand Police. (2007b). *Search and rescue annual statistics report 2006/2007*. Wellington: New Zealand Police.

New Zealand Police. (2007c). Search and rescue incident database: New Zealand Police.

Royal Canadian Mounted Police. (2007). Search and rescue. Retrieved 25 October, 2007, from www.rcmp-grc.gc.ca/ccaps/sar_e.htm

Scott, G., & Scott, H. (2007). An economic impact scale for outdoor health and safety management. *6th iHEA World Congress*. July 8-11, Copenhagen. iHEA.

Southern Cross Medical Care Society. (2008). Ultra Care Plan. Retrieved 21 April, 2008, from http://www.southerncross.co.nz/sx_internet/library/v14120_3.pdf

Spellerberg, A. (2001). *Framework for the Measure of Social Capital in New Zealand*. Wellington: Statistics New Zealand.

Statistics New Zealand. (2007a). New Zealand population clock.

Statistics New Zealand. (2007b). Non-profit institutions satellite account: 2004. Quickstats Retrieved October 12, 2007, from http://Stats.govt.nz

Statistics New Zealand. (2008). Quarterly Employment Survey March Quarter 2008.

Summers, A. (2001). Volunteering in emergency services: the South Australian perspective. Australian Journal of Emergency Management(Spring), 2-4.

Wellington Land Search and Rescue. (2007). Wellington LandSAR. Retrieved 26 October, 2007, rom http://www.wlsar.org.nz/General/faq.html

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