

Interpreting human and horse interactions

Equestrian injuries

A review of the literature



A report for the
Accident Compensation Corporation
2006

Glenda Northey, MA (Hons), MLIS

Contents

ABSTRACT	iii
LIST OF FIGURES	vi
ACKNOWLEDGEMENTS	vii
ABBREVIATIONS/GLOSSARY	viii
EXECUTIVE SUMMARY	x
1. INTRODUCTION	1
1.1 Aim:	1
1.2 Method:	1
1.2.1 Key words:	2
1.2.2 Keywords used in this search:	2
1.2.3 Key Sources:	3
1.3 Data:	3
2. CURRENT NEW ZEALAND EPIDEMIOLOGY	6
3. A BRIEF OVERVIEW OF INTERNATIONAL AND NATIONAL STUDIES.	11
4. INTERVENTIONS TO 1996	14
Primary interventions	14
Secondary interventions	14
Tertiary interventions	14
A summary of their findings:	15
4.1 Rules and regulations.	15
4.2 Rider experience and knowledge.	15
4.3 Appropriate equipment and clothing.	16
4.4 Environmental factors	17
4.5 Protective clothing.	17
4.6 Medical contraindications.	18
4.7 First aid.	18
4.8 Other.	18
5. RECOMMENDATIONS FROM THE LITERATURE	20
5.1 Strengthening Individual Knowledge and Skills	22
5.1.1 Helmets	22
5.1.2 Safety stirrups	24
5.1.3 Fall techniques	25
5.1.4 Checking tack	25
5.1.5 First Aid	25
5.1.6 The use of ropes, lead ropes or reins	25
5.1.7 Increased skill and knowledge	26

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

5.1.8	Body protectors	27
5.1.9	Lessons	28
5.1.10	Other protective clothing	29
5.1.11	Matching horse with rider	30
5.1.12	Horse behaviour	30
5.1.13	Pregnancy	31
5.1.14	Alcohol and drugs	31
5.2	Promoting Community Education	32
5.2.1	Safety education	33
5.2.2	Resources and Information	34
5.2.3	Farming/ horse or animal injuries programs	34
5.2.4	Targeted programs	35
5.2.5	Role models	36
5.3	Educating Providers	38
5.3.1	Education	38
5.3.2	Health & Safety	39
5.4	Fostering Coalitions and Networks	41
5.4.1	Helmet campaigns	42
5.4.2	Road safety campaigns	42
5.4.3	Resources – video and manuals	43
5.4.4	Safety stirrups	44
5.4.5	Insurance providers	44
5.5	Changing Organisational Practices	46
5.5.1	Leadership from equestrian regulatory organisations	47
5.5.2	Helmets	48
5.5.3	Safety Committees	48
5.5.4	Supervision	49
5.5.5	Tertiary medical care	49
5.5.6	Risk management	50
5.5.7	Code of practice/guidelines	51
5.5.8	Accreditation	51
5.5.9	Certification of teachers	52
5.5.10	Environmental modification and checklist	52
5.5.11	Protective clothing	53
5.5.12	Alcohol and drugs	53
5.5.13	Properly trained horses	54
5.6	Influencing Policy and Legislation	55
5.6.1	Helmets:	56
5.6.2	Protectors or vests	58
5.6.3	National guidelines or codes for riding schools	59
5.6.4	Injury surveillance	60
5.6.5	Health & Safety	62
6.	Bibliography	64

ABSTRACT

Horse riding was a popular recreational activity worldwide. However, injuries associated with horse riding, although only a small percentage of all injuries tended to be more severe than other leisure or sporting activities. It was found that horse riding claims were as expensive as motorcycle riding, and double that of rugby (ACC 2005). This was due to the multiple mechanisms of injury which can occur. The cost of equestrian injuries in NZ in 2004 was over 1.5 million for new claims and 3.4 million for on going claims (ACC 2005). Analysis of New Zealand Health Information data for 1993-1999 found that 16 people died following horse related injuries. For the period 1993-2003, 9599 people were hospitalised for horse related injuries.

In a search for countermeasures or interventions for equestrian injuries a literature review of medical and sports literature databases and the internet was undertaken. The results indicated that although a substantial amount of information was available, the majority of studies were on the epidemiology of horse related injuries rather than evaluations of programs or interventions for best practice. Much of the information on prevention was anecdotal.

The use of education programs, knowledge of horse behaviour, riding experience, the use helmet and protective clothing, rules and regulations, codes of practice, accreditation, first aid – primary, secondary and tertiary, fall techniques, matching horse with rider, alcohol use, lessons and the need for injury surveillance databases, collaboration between community, industry and insurance companies, legislation and regulation are some of the countermeasures examined in this review.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

The recommendations in this review have been presented using the spectrum of prevention which provides a multifaceted approach to injury prevention. This allows multiple actions/activities, within the six levels of the spectrum, to be implemented simultaneously to create a more comprehensive and systematic approach to injury prevention.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

LIST OF FIGURES

Figure 1 Hospitalisation numbers for horse-related injuries by gender and age	14
Figure 2 Hospitalisation numbers for horse-related injuries by ethnicity, age and gender (NZ/O = New Zealand Pakeha/European/Other)	15
Figure 3 Hospitalisations for horse-related injuries by injury site	17
Figure 4 Hospitalisation numbers for horse-related injuries by region	18
Figure 5 Hospitalisation rate for horse-related injuries by region	19

ACKNOWLEDGEMENTS

The author wishes to thank the Accident Compensation Corporation for their funding to undertake this literature review. Thanks in particular to William Atkinson for his support.

A big thanks to the librarians who assisted me in procuring the documents needed to write the literature review.

Support shared by Tomas, Ella and Greg.

ABBREVIATIONS/GLOSSARY

AAP	American Academy of Pediatrics
ACC	Accident Compensation Corporation
A&E	Accident and Emergency Department
AHIC	Australian Horse Industry Council
BHS	British Horse Society
Ecode	E-codes are used to define environmental events, circumstances and conditions such as the cause of injury, poisoning, and other adverse effects related to injury hospitalizations and mortality. They provide supplementary information on external factors associated with morbid conditions, or death. The 4 digit ecode reflects the cause of the patients most serious injuries. The codes range from E800 to E999.
ED	Emergency department.
EFA	Equine Federation of Australia.
Equine	Of or pertaining to a horse.
Horse riding establishment	A business that provides horse for hire for riding or to be used in providing instruction in riding whether the horse are ridden on the grounds of the establishment or elsewhere.
ICD	International Classification of Diseases. A classification system of diseases, health conditions and procedures developed by the World Health Organization (W.H.O.), which represents the international standard for the labeling and numeric coding of disease used widely in the health care field. These codes provide a worldwide standard for comparison of birth, death and disease data.
ICD-9 revision	International Classification of Diseases 9 th

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

ICD-10 revision	International Classification of Diseases 10 th revision
	Interventions/countermeasures. Changes to behaviour or practice
IPRC Auckland	Injury Prevention Research Centre, University of Auckland
IPRU Otago	Injury Prevention Research Unit, University of Otago
MoH	Ministry of Health
Mounted	Riding: hacking (recreation and pleasure), trekking, racing, show jumping, dressage, eventing, hunting and polo, rodeo not trotting or harness racing.
NEISS	National Electronic Injury Surveillance. Administrated by US Consumer Product Safety Commission
NSW	New South Wales, Australia
NZHIS	New Zealand Health Information Services
NZHISMD	New Zealand Health Information Services Minimum Dataset
NZIPS	New Zealand Injury Prevention Strategy
OSH	Occupational Health and Safety, Dept. of Labour
PPE	Personal protective equipment
ROSPA	Royal Society for the Prevention of Accidents
	Unmounted/non-riding (on ground/handling): general horse handling – feeding, grooming, shoeing, leading and unrelated such as playing or being in vicinity)
USPC	United States Pony Club
WRFIS	Work-related Fatal Injury Study
WHO	World Health Organisation

EXECUTIVE SUMMARY

Horse riding was a popular sport in many counties. Sport and Recreation New Zealand's 2001 data (SPARC 2003) stated that horse riding and equestrian sport and leisure activities in New Zealand had a participation rate of 5% over a 12-month period for New Zealand adults, and 9% for those aged 18 to 24. During 2001, 133 400 adults participated in a horse-related activity and horse riding was included in the list of top sports and activities undertaken by New Zealand women.

This number was made up from recreational/leisure riders and occupational riders and workers. The equine industry in New Zealand employs over 28,000 full time and part time workers. There were 159 racing clubs which offer 2000 race meets per year (KiwiCareers 2004). It was suggested that the injury incidence from horse riding was as high as 21 per 100,000, and was 160 times higher for horse racing (Petridou et al 2004). Christey (1994) estimates the injury rate to be 0.6 per 1000 riding hours. The rate of serious injuries per number of riding hours was estimated to be higher than motorcyclists and automobile racers (Sommers 1999).

NZHIS data reported that the major horse related injury site was the head, followed by upper extremities, in particular the arms. Those riders considered most at risk were young girls and youth. Standardised protective clothing had been designed with an aim to decreasing injury severity but wearing helmets and protective vests is still mandatory for most riders. Only in organised sports such as racing clubs, eventing, cross country, and pony clubs was helmet wearing compulsory. Until there was scientific proof that protective

clothing does reduce injuries many riders are still to be convinced of their worth.

ACC injury statistics for 2004 lists new claims/amounts and ongoing claims/amounts and showed that the highest number of claims is for 'other injury site' (193/\$986,000 and 93/\$2,816,000) followed by hip/upper leg/thigh (23/\$1226,000 and 10/\$197,000), and lower back/spine (26/\$133,000 and 9/\$182,000). The total cost of equestrian injuries in NZ in 2004 was over 1.5 million for new claims and 3.4 million for on going claims (ACC 2005).

The last decade has seen a significant number of safety publications published for the equine industry. These included manuals, strategies, codes of practice and guidelines all geared to provide riders with more information on the risks of riding and best practice guidelines. However, the effectiveness of many of the injury prevention countermeasures suggested within the literature has still to be scientifically researched.

The overall aim of this review is to critically review the literature on injury prevention measures, or countermeasures, for horse related injuries within the equine industry. It includes a limited number of evaluative studies. It is accepted that support for these countermeasures is generally in the form of anecdotal or informed opinion. The main countermeasures examined in detail are : helmets, organisational change, protective clothing, first aid, improved data collection, falling techniques, programs in occupational health and safety, risk management, community coalitions and cooperation with the insurance industry, programs on helmet wearing, environmental changes, manuals, guidelines and codes of practice, legislation and regulation.

1. INTRODUCTION

The proliferation of information available through the internet and databases can be both an advantage and a problem. This research project aimed at examining equestrian injuries and countermeasures for prevention became a paradox of information overload. A huge amount of material on the epidemiology of horse-related injuries was easily located through databases. However, because injury prevention is multidisciplinary and involves many disparate fields, a lot of the material which supported the research was rarely found in a single repository. Alongside the formal channels such as databases there were the informal channels such as the Internet and the World Wide Web to search. Managing to sift through this endless medium of information the librarian or information specialist comes into their own as they provide the practitioner or policy maker with information that can be developed into well researched prevention policies and programs which will facilitate in the prevention of injury and save lives.

1.1 Aim:

The aim of the literature review was to gather and critically evaluate the literature, both formal and informal, which examined equestrian injuries, in conjunction with any proposed injury prevention strategies, measures and countermeasures. This literature review was 'part of the larger endeavor of research synthesis that is the analysis, interpretation, and use of scientific enquiry' (Garrand 2004:6). The report includes national and international literature for prevention of injury in different sectors of the equine industry which will provide a basis for future injury prevention programmes.

1.2 Method:

Articles in English language were sourced for the past 15 years. However important articles from years prior to this period have been included to enable a broader view to the

topic and enable more comparison and evaluation of prevention programmes.

1.2.1 Key words:

There are two main methods of keyword searching. They are the use of controlled vocabulary such as used by *Medical Subject Heading: annotated Alphabetical list (MeSH headings)*. The Medline database uses MeSH headings which can provide a primary focus or be expanded to be more general. This method indexes keywords and provides suggestions for related, boarder and narrower terms as well as indicating preferred terms. Natural language queries were also undertaken to ensure complete coverage. Keywords were also truncated (stemming or root expansion) and combined (Boolean logic).

In Boolean logic the searcher can limit the search. For example searching under equestrian injuries will also locate articles on injuries to horses as well as to injuries to humans, so a Boolean search can eliminate the horse injuries from the final results.

Key words or terms are also found within abstracts on electronic databases. For example, articles abstracted in Current Contents list key words in two ways: author keywords which are the 4 terms provided by the author and Key Words Plus which are terms what the Currents Contents staff adds.

1.2.2 Keywords used in this search:

Horse, horses, equine, equestrian, injury, horse riding, horseback, unintentional injury, disability, rehabilitation, sports, helmets, horse racing, riding, eventing, animal-related injury, safety, best practice, guidelines, code of practice, protective equipment, countermeasures, mortality, morbidity, recreational activities, legislation, rules and regulations, athletic injuries, adolescents, child*, accidental falls, head protective devices, injury severity score, risk factors, fractures, head injury, traumatic brain injury, farm

related injury, safety clothing, prevention, injury prevention, strategies, instruction, programmes and prog* , work related, jockey, riding,

1.2.3 Key Sources:

Electronic databases –

Medline, Current Contents, Psych Lit, Sport Discus, CINAHL, Ausport Med, Caredata, Cochrane Database of Systematic Reviews (CDSR), Expanded Academic, Health & Society, Health and Medical Complete, Index NZ: INNZ, Scopus, Journal @ OVID, Science Direct, Social Science Plus, Te Puna, ECSOhost, Proquest Digital dissertations, Academic Search Elite and ABI/Inform.

Keywords were used in electronic databases as well as citation searching. Citation searching provides a link to what has cited the work being examined as well as access to the bibliography of what has been cited within the work. This mapped trends in current research and generated a list of journal articles related to topic.

Internet sites:

- Emails, discussion groups, and the WWW.
- Search engines: Google, and meta and multi-search engines such as Inxquick and Kartoo.

The snowball effect has been used to find resources by using the bibliography and references in the papers already examined.

1.3 Data:

Mortality data for the period 1993–1999 and morbidity data for the period 1993–2001 were sourced from the New Zealand Health Information Service (NZHIS) Minimum Data Set using ICD-9 from 1993-1999 and ICD-10 for 2000 onwards. The injury deaths data are from 1993-1999 (ICD-9) and 2000-2001 (ICD-10). As they are different ICD codes, they are not quite comparable.

Morbidity records relate to those patients hospitalised for three hours or more with a primary diagnosis of injury.

Records were only included if the person survived the injury, and if the record was the first admission for the injury event. Data were grouped by age: 0–9 years, 10–19 years, 20–29 years, 30–39 years, 40–49 years, 50–59 years, and 60 years and older. All data were analysed using SAS Version 9.0 for Windows. Ethnicity data were examined only for the period 1996–2001 as changes were made to the definition of ethnicity in 1995. Consequently, 1996 was the beginning of a new time series for ethnicity data.

Deaths and injury hospitalisations from horse related injury were extracted from NZHIS minimum dataset by the selection process used by Cripps (2000) with animal related injury external cause code categories E810.5 to E825.5 ('motor vehicle traffic accident') and E826.3 to E829.3 (other road vehicle accident). In this report E906 ('other injury caused by animal', which includes external causes such as 'fallen on by horse', 'animal not being ridden' 'stepped on by animal', 'bite by horse' has been included because all the data has been cleaned by an examination of the free text narratives and mechanism of injury information and all other animals have been removed.

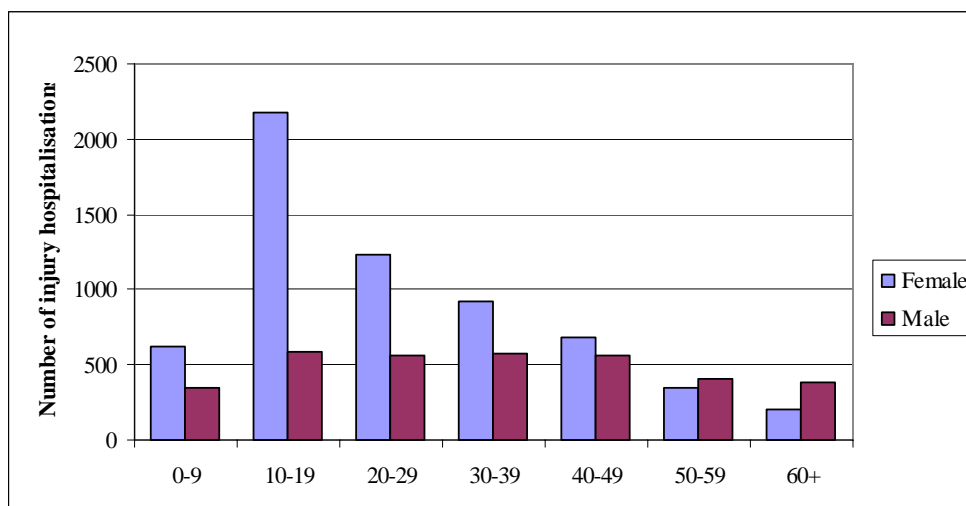
Ecodes - external causes:

- E8135 Motor vehicle collision – Animal ridden
- E8155 Motor vehicle collision with object – Animal ridden
- E8165 Loss Control MV – Animal ridden
- E8195 Traffic acc nos – Animal ridden
- E8215 Other road MV – Animal ridden
- E8245 N- Traffic Brd/Alit – Animal ridden
- E827 Animal drawn vehicle acc
- E8272 Animal Drawn Vehicle – Vehicle – Animal ridden
- E8273 Animal Drawn Vehicle – occupant
- E828 Ridden animal acc
- E8282 Ridden animal acc – rider
- E906 Other injury caused by an animal
- E9063 Animal bites
- E9068 Injury nec caused by animal
- E9069 Injury nos caused by animal

2. CURRENT NEW ZEALAND EPIDEMIOLOGY

Analysis of NZHIS data for 1993–1999 found that 16 people died following horse-related injuries. For the period 1993–2003, 9599 people were hospitalised for horse-related injuries. Females accounted for 64.4% (n = 6186) of injuries and 56% (n = 9) of deaths. Those most at risk of horse-related injuries were young females between the ages of 10 and 19 years, who accounted for 22.6% of these injuries. A large number of the total injuries sustained (38.8%) were to those under 19 years of age. Those aged between 10 and 29 years received 47.5% of horse-related injuries. In those aged 50 years and above (14% of all patients), males were more at risk than females although the injury numbers for this age group were low (**2.5%** of all injuries) (Figure 6).

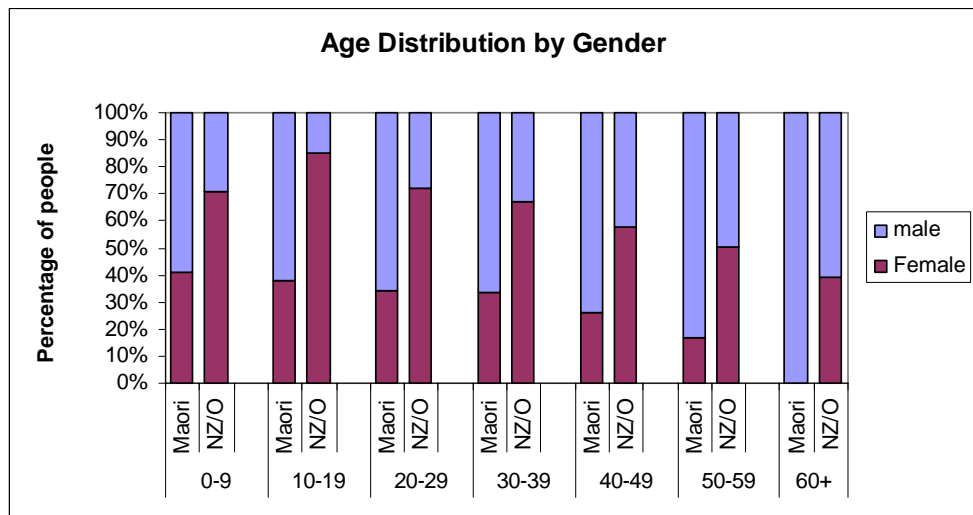
- **Figure 6** Hospitalisation numbers for horse-related injuries by gender and age



An examination of the data (1996-2003) on ethnicity indicates an interesting trend relating to Maori (the indigenous people of New Zealand) when results are juxtaposed with those of other ethnic groups (Figure 2). The majority (89%) of those injured was NZ Pakeha/European/Other; 11% were Maori and 0.3% Pacific. Within Maori those most at risk were Maori males.

Approximately two thirds (66%) of injuries to Maori were to males, compared with 32% to NZ Pakeha/European/Other males. Maori females accounted for 34% of injuries to Maori, while NZ Pakeha/European/Other females sustained 68% of injuries to NZ Pakeha/European/Other. In the age group 60 years and over, all Maori injuries were to Maori males. Injuries to Maori were highest in the regions of Bay of Plenty (27.4%), East Coast (20.7%) and Northland (15.7%).

- **Figure 7** Hospitalisation numbers for horse-related injuries by ethnicity, age and gender (NZ/O = New Zealand Pakeha/European/Other)

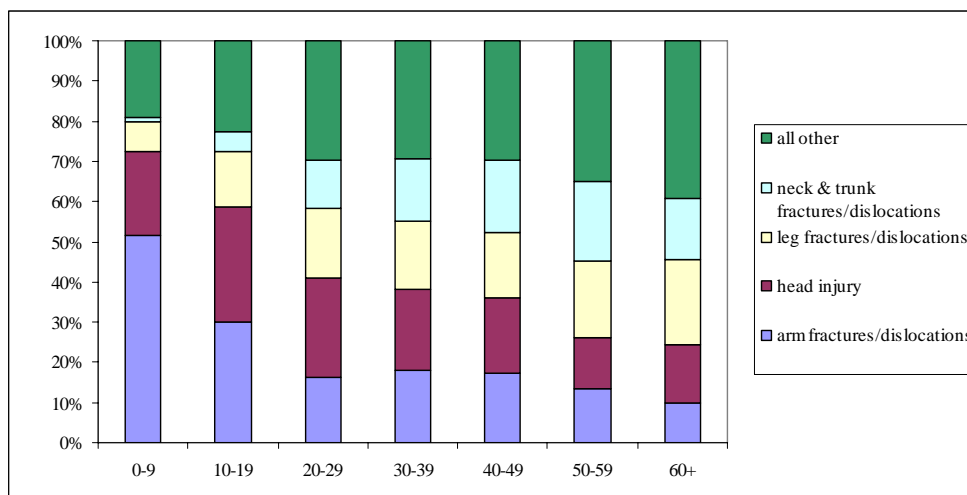


Data indicated that the major injury site was the arm (24.5%) (Figure 3). This included fractures and dislocations. Arm fractures and dislocations increased from 186 (26%) in 1993 to 206 (31%) in 2001. Head injuries accounted for 22.3% of injuries. However, the number of head injuries decreased from 175 (25%) in 1993 to 134 (20%) in 2001. Leg injuries accounted for 15.5% of injuries. Leg fractures and dislocations also decreased from 145 (20%) in 1993 to 100 (15%) in 2001.

Between the ages of 0 and 9 years, 51.7% of injuries were to the arms. Head injuries were 20.5%. Between the ages of 10 and 19 years, head (28.5%) and arm injuries (30%) were almost equal in numbers. Between 20 and 24 the major injury site was the head (24.5%). Head injuries and

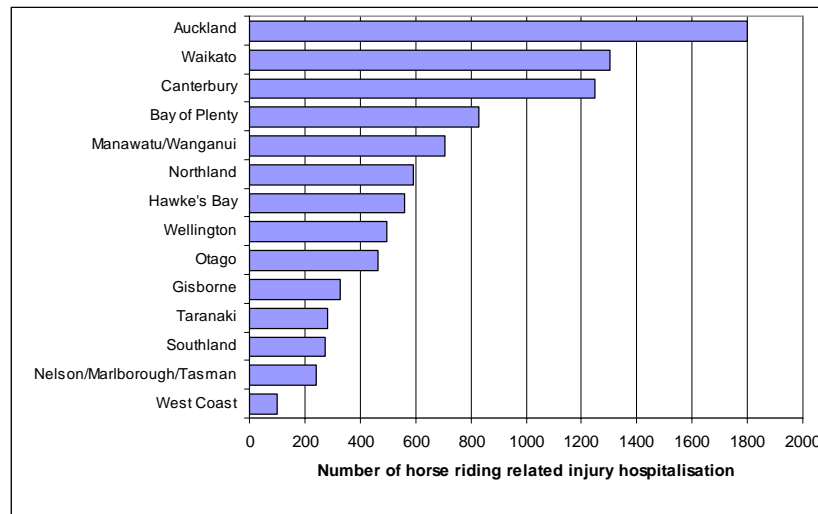
fractures/dislocations of the neck and trunk increased for those aged 30 years and over. Between 50 and 59 years, fractures and dislocation to the neck and trunk (19.7%) and leg fractures and dislocations (19%) were almost equal. For those over 60 years, leg fractures and dislocations were most common (21.5%). The percentage of injuries recorded as 'other injuries' increased with age from 19% in 0 to 9 years up to 39.3% with 60 years and over.

■ **Figure 8** Hospitalisations for horse-related injuries by injury site



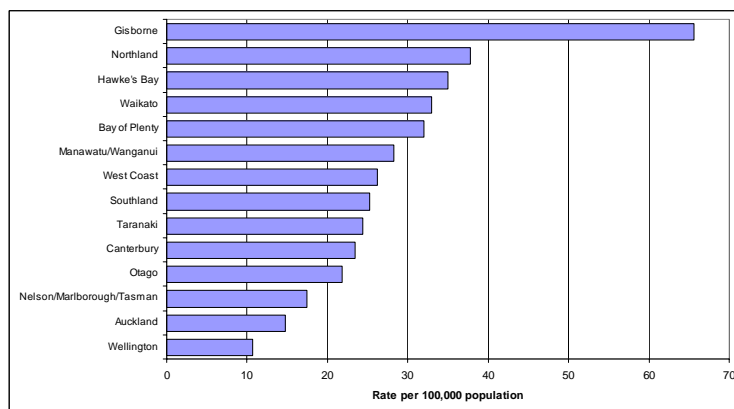
A regional comparison of injury rates revealed that Greater Auckland sustained the highest number (1800) of horse-related injuries. Waikato (1304) and Canterbury (1250) followed closely. East Coast (Gisborne and Hawke's Bay) sustained 885 injuries. The lowest number of injuries was received on the West Coast of the South Island (101)

■ **Figure 9** Hospitalisation numbers for horse-related injuries by region



However, Auckland's injury rate was one of the lowest (15 per 100 000). The highest injury rate was recorded on the East Coast – Hawke's Bay and Gisborne (104 per 100 000) followed closely by Manawatu/Taranaki/Wanganui (52 per 100 000), the Bay of Plenty (32 per 100 000), Northland (38 per 100 000) regions. The lowest rates were in regions that have significant urbanisation, although Greater Auckland and Wellington (11 per 100 000) include urban and rural areas (Figure 5).

■ **Figure 10** Hospitalisation rate for horse-related injuries by region



Farms (6.3%) and places of recreation and sport (6.1%) were the most predominant locations at which injuries

occurred. Injuries were also sustained on streets and highways (5%) and at home (5%). The location of more than three quarters of all horse-related injuries was unspecified (70.8%).

The majority of injuries (72.5%) were sustained while riding; 27.5% were sustained during non-riding activities (including tacking up or grooming). An analysis of NZHIS free-text data shows that a significant number of riding injuries were the result of a fall, while injuries on the ground were often the result of being crushed between the horse and an object or being stomped or trampled.

Free text data from NZHIS Minimum Data set provided more details on the injury event but failed to specify important details about safety clothing, the location where the accident occurred and in many cases what injury occurred. Linking injury outcomes with these details would enable researchers to more accurately identify areas for injury prevention strategies.

An investigation of ACC injury statistics for sport found that horse riding claims were as expensive as motorcycle riding, and double that of rugby (ACC 2005). This was due to the multiple mechanisms of injury which can occur. ACC injury statistics for 2004 lists new claims/amounts and ongoing claims/amounts and showed that the highest number of claims is for 'other injury site' (193/\$986,000 and 93/\$2,816,000) followed by hip/upper leg/thigh (23/\$1226,000 and 10/\$197,000), and lower back/spine (26/\$133,000 and 9/\$182,000). Each new claim averaged \$4776 and an ongoing claim averaged \$25,000. The cost of equestrian injuries in NZ in 2004 was over 1.5 million for new claims and 3.4 million for on going claims (ACC 2005).

3. A BRIEF OVERVIEW OF INTERNATIONAL AND NATIONAL STUDIES.

Pounder (1984) suggested that there are nine ways that horse related injuries can happen they are: fall from horse, crushed by horse, kicked by horse, strike by an object (tree or branch) while riding, become entangled in stirrup, become entangled in reins, receive a blow from the horses head, be stepped on by horse, be bitten.

Recent studies have reported that horse related injuries can be caused by falls/thrown from horse 67%, 19% kicks from horse, 12% crushed by horse and 4% caused by motor vehicle (Griffin 2002). Falls accounted for 66.5% of horse related injuries in farming, 87.5% during sport and 84.7% during racing (Petridou et al 2004). Lack of attention is another major cause cited for injuries (Roe et al 2003). The rate of falls increased from pre novice to advanced due to more jumping efforts (Cripps et al 2002). Falls were reported to be a rate of 2 falls per 10,000 jumping efforts (Cripps & O'Brien 2004).

Silver (2002) suggested that riders received 1 injury per 100 hours for leisure riding, 1 injury per 5 hours for amateur racing with jumps, and 1 injury per 1 hours riding when participating in cross country eventing (Strickland 2000). Christey (1994) estimated the injury rate to be 0.6 per 1000 riding hours. In the adventure and tourism industry it is suggested that the rate is as low as 1 per million participation hours (Bentley et al 2000). The injury incidence from horse riding was 21 per 100,000, and this was 160 times higher for horse racing (Petridou et al 2004).

Head injuries were the most common cause of death (72-78%) and serious injury (55-100%) in horse related injuries (Nelson & Bixby-Hammett 1992, Griffin 2002, Abu-Zidan &

Rao 2003). Broshek (2004) reported one head injury per 25 equestrian events. In Greece the farming population had the highest rate of head injuries (48.2%) (Petridou et al 2004). The most common injury sites were the head and upper extremities. The head, neck and face received 49% of injuries (Ghosh et al 2000).

Between 60-80% of trauma was caused by head injuries (Yurgil 2004). Farming received 17.7% traumatic brain injury, racing 9.5% and sports 8.5% (Petridou et al 2004). Head injuries outnumbered spinal injuries by 5:1 which suggested that the force required to cause a head injury is less than that to fracture the spine (Silver 2002). Of those injured 31% received multiple injuries and 69% single injuries. Fractures, sprains and strain injuries were the most common (Yurgil 2004).

Horse related injuries occurred most frequently while the horse was being ridden (73%) but injuries can occur while the rider was working around the horse (27%) (Bixby-Hammett 2000).

The mean hospital stay was 11.2 days, although those injured by a blow by the horse as a primary cause had a longer stay of 29.4 (Abu-Zidan & Rao 2003). Ninety percent of those seen at an ED were hospitalised for less than one day (Otopalik 2003-4). The mean time off work was three weeks and 195 chronic disabilities (Frankel et al 1998). Long term disability for children was two weeks absenteeism from school and four months from riding. Dekker et al (2004) found that 41 of 1000 child respondents still experienced disabilities.

The average jockey sustained 2.5 fractures in their career, and they participated in about 600 races per year. The most common cause of injury was becoming unseated, followed by the horse falling. In the study 453 jockeys sustained 1113 injuries, with 288 jockeys sustaining more than two injuries. Concussion was reported by 13% of jockeys. The main injury site was the leg (24.4%) and the mean days of work missed

from fracture was 93 (Press et al 1995). Waller et al (2000) found that injuries to jockeys had increased by 33% between 1993 and 1996. The most common location for injuries to occur was when entering, within or leaving the starting gate (35%).

Polo players received an overall injury rate of 7.8 per 1000 player game hours. Injuries received during polo were generally severe with fractures and facial lacerations as the most common (Costaz-Paz et al 1999). For those working in stables kicks were the principle mechanism of injury (39.2%), falls sustained 18.1% and trampling 15.3%. The upper body received the most injuries with the chest sustaining 17.7% and the shoulder and upper limbs 20.4% (Iba et al 2000).

Young amateur riders with a mean age of 27 were most at risk (Yurgil 2004), although it was acknowledged that more females ride. On farms females received 65% of animal related injuries were from horses (Dimich-Ward et al 2003). Three quarters of the riders in one farm study were not wearing a helmet (Hendricks & Adekoya 2001). In urban areas females received more injuries during sport and recreational activities but in rural areas young men involved in riding secondary to their occupation were seen to more at risk. Almost half the horse related injuries involved people under the age of 20 years (Hockney & Miles 2001).

The major reasons for cause of injury were given as 'horse took fright' from traffic, people or noises (Dekker 2004). Williams and Ashby (1995) used free text to determine causation and found 39% were due to horse behaviour and 16% when jumping. Fear based behaviour by horses is seen as a major cause of accidents due to the fear and flight response, the horse's sensory perceptions and their animal behaviour patterns (Grandlin 1999).

4. INTERVENTIONS TO 1996

Finch and Watt (1996) provided a detailed review of equestrian injury countermeasures to 1996. They evaluated horse riding countermeasures through a matrix which split the literature into three key areas which they suggest provide opportunities for injury prevention and control. Rather than reinvent the wheel this review uses their findings and conclusions as a foundation document although it expands the matrix and uses the spectrum of injury to provide a multifaceted approach for injury prevention. An overview of the three key areas of Finch & Watt's report follows:

Primary interventions

These are aimed at preventing the injury event from occurring. Primary countermeasures include rules and regulations, knowledge of horse behaviour, well conducted lessons, attention to contraindicated medical conditions, public and rider education, checking tack before riding, appropriate equipment and riding environment, trainer education, modification of the environment, improving general horse and rider fitness, adequate supervision of children, controlling onlookers at equestrian events, training riders and handlers in appropriate horse handling, stabling and transport techniques.

Secondary interventions

These are aimed at the reduction of severity of injury: These include the proper design and wearing of protective clothing such as protective helmets and body protectors, planned programs to broaden rider experience, safety stirrups, and training in falling techniques.

Tertiary interventions

Interventions aimed at minimising the consequences of injury, post event. These include quick response for assessment and treatment of injury, first aid knowledge and equipment, prompt referral to specialist, and improved rehabilitation before rider is allowed to return to riding.

A summary of their findings:

4.1 Rules and regulations.

Many equestrian organisations in the equine industry have rules and regulations in place which dictate the conduct of those participating in the sport. Some rules are in relation to the wearing of protective clothing, others such as jockey clubs also require the registration and licensing of jockeys, trainers and stable hands. Other regulations for jockey clubs include a log of all accidents, construction of courses, slopes, fences and rails, procedures for saddling up and returning from the finish line, video recording of races, the use of protective headgear, and the use of spine protection. Racecourses are inspected prior to a meeting. All state that protective helmets must be standard approved and must be replaced after a fall.

4.2 Rider experience and knowledge.

- Knowledge and behaviour. Horses can be unpredictable. A five year study in the US found that 76% of accidents had been caused by the action of the horse (Bixby-Hammett 1987). It was suggested that comprehensive training of the horse, or a warm up program could reduce unpredictability. Other suggestions included some for workers on the ground: an awareness of the significance of the horse's actions; awareness of cars or other animals; and the adoption of a safe calm working manner.
- Well conducted lessons. Because of the high number of injuries and fatalities during lessons it was suggested that riders ensure that their instructors are certified, have an extensive knowledge of horses and horsemanship and are experienced in giving lessons.
 - Rider education. The correlation between youth and horse related injury has been well discussed in the literature. Research suggests that increasing age also means increased knowledge and skills therefore by

this theory increased age should show a decrease in injury frequency. Unfortunately as shown by Bixby-Hammett 1992 riding experience does not always equate to knowledge and skill. It was suggested that training in safety measures needs to be given to all riders and horses. A school educational program in Australia, (Lower & Wolfenden 1995) which mainly consisted of educational resources, showed statistical improvements in the children's knowledge and improvements in attitudes towards helmet wearing were recorded after the program. Formal training was needed in rural areas where supervision is by parents rather than pony clubs.

- Public education. It is suggested that public campaigns are effective in showing dangers from horse riding these include educational programs for parents, riding instructors, horse show organizers and managers demonstrating prevention strategies.
- Rider experience. There was a difference in opinion over experience as opposed to knowledge and skill as some studies (Bixby-Hammett 1992) found that more experienced riders were involved in more accidents because they ere involved in more risky events and jumping activities.
- Falling techniques. The instruction of the 'tuck and roll' technique for an early age could prevent injuries. This method was used by jockeys who have a low injury rate.

4.3 Appropriate equipment and clothing.

There was a need to ensure all equipment is of good quality and design. Ill fitting tack could become detached during riding causing injury. Wearing the appropriate gear when riding was considered very important. Hair should be tied back and clothing should be fitting to prevent it catching on any obstacles. Jockeys wear goggles, helmets and protective vests and some of these items could be considered by other

riders. Non skid gloves can prevent friction burn and proper footwear such as riding boots with a smooth sole and heel could protect the feet as well as prevent the foot sliding forward in the stirrup. It was suggested that high boots also provided protection acting like splints in the case of a fall.

4.4 Environmental factors

There are natural hazards in the riding environment which can not be modified, in some sports they are an integral part of the activity. Where it can be modified are areas such as the provision of an energy absorbent riding surface, or the allowance of riders to use grass strips instead of riding on the road, and the modification of race tracks such as wooden rails changed to plastic or aluminium.

4.5 Protective clothing.

Protective clothing worn by riders has not been proven to prevent injuries. Anecdotal evidence has shown that injuries have been less severe by the wearing of helmets, the theory being that wearing a hat is better than not as long as it is worn correctly and properly fitted. Controversy over design still exists, particular when it comes to central nervous system and spinal injuries. There are still barriers to wearing helmets within the sport by groups who have not traditionally worn them and who suggest that they find the cost prohibitive. Safety stirrups are another protective device which still has not been formally evaluated. As with ordinary stirrups the foot must fit through with two or three centimeters on either side of the foot and the mechanism which releases the foot when under tension prevents the rider being dragged by the horse. Safety stirrups are not used by jockeys because they are considered too heavy and cumbersome and the light weight of the jockey may not be

sufficient to activate the release mechanism. Body protectors have not been evaluated to date however because horse related injuries often tend to be soft tissue and upper extremities it has become mandatory in some sports such as racing and eventing. Elbow and knee pads have also been suggested as protective clothing for children.

4.6 Medical contraindications.

Those who sustain a head injury should be examined by a medical professional before being allowed to continue riding. Those with other medical conditions such as lumbar or neurological injuries are at increased risk.

4.7 First aid.

It was found that evidence supporting the use of tertiary first aid in the form of medical professionals attending events and race meeting was minimal. There are varying degrees of first aid offered at different events. Some require only St John's Ambulance personnel, others more in the form of an ambulance and/or medical practitioner. It was reported that no specific training was given to medical personnel at equestrian events. They cited the booklet produced by the American Equestrian Association for guidelines on medical care coverage at events.

4.8 Other.

This included matching horse with rider; no children should have a horse which is under 5 years old; supervision of children around horses; and alcohol avoidance.

Finch and Watt recommended further research on risk identification, evaluation of education programs, and formal evaluation of effectiveness of protective clothing such as

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

helmets as they reported that many of the countermeasures in protective clothing which were recommended in the literature have been yet to be scientifically evaluated or trialled.

5. RECOMMENDATIONS FROM THE LITERATURE

Findings from the current literature review are integrated into the recommendations in this chapter. The key areas which were highlighted are the need for a national injury surveillance system which records more event details, more scientific research on the benefits of wearing on protective clothing, helmet design suitability for different sports, more targeted education programs, a code of practice and safety guidelines for horse riding establishments, face protectors for polo players, the use tertiary medical care, regulated helmet standards, concussion management programs with groups or clubs, mandatory helmet wearing particularly in public areas such as roads, the need for OSH organisations to be proactive in the education of riders in safety methodology particularly in the area of farming.

The Spectrum of Prevention (Cohen & Swift (1999) provides a multifaceted approach to injury prevention. This allows multiple actions/activities, within differing levels of the spectrum, to be implemented simultaneously to create a comprehensive approach to injury prevention. The six-interrelated action levels have been utilized in the recommendations of this report to enable each section of the community to be empowered. The Spectrum allows injury prevention to go beyond the individual and helps to develop a more encompassing comprehensive approach to injury prevention for all involved in equine activities. Health education and promotion programs are designed to reach individuals at risk of injury and encourage them to change their behaviour. However, 'prevention is more than education and goes beyond the individual' (Cohen & Swift 1999; 204) there must be change at many levels.

Levels 1-4 of the Spectrum highlight building skills and awareness and support among individuals, communities and

professionals. Levels 5-6 highlight the part that industry and government (national and local) play in making changes that influence environment, policy and design. An activity within any of the spectrum's six levels constitutes an intervention. When the initiatives or activities are combined they are a transformative force for individual, community and societal health.

■ **Table 1 Spectrum of Prevention**

Level	Explanation
1 Strengthening Individual Knowledge and Skills	Enhancing an individual's capability of preventing injury or violence
2 Promoting Community Education	Reaching groups of people with information and resources to promote health and safety
3 Educating Providers	Training professionals who will transmit skills and knowledge to others
4 Fostering Coalitions and Networks	Bringing together groups and individuals for broader goals and greater impact
5 Changing Organizational Practices	Adopting regulations and norms to improve health and safety and creating new models
6 Influencing Legislation	Policy Developing strategies to change laws and policies to influence outcomes in health, education and justice

Recommendations found in the reviewed literature have been placed within the appropriate section of the spectrum along with summaries of best practice programs. If they fit the criteria of several levels they may be repeated in less detail.

5.1 Strengthening Individual Knowledge and Skills

Cohen & Swift (1999: 3) stated that 'strengthening individual knowledge and skills involved transferring information and know-how to increase an individual's resources and capacity for preventing injury.' Enhancing an individual's knowledge ensured their ability to lay claim to agency over injury prevention. This can involve an organisation or agency using a primary approach to help individuals through the provision of resources or programs. It also involved individuals assisting their peers to create a safe environment.

This section recommends: showing how helmets can be worn properly and safely; learning risks involved in riding; learning how helmets protect the head; providing a checklist to run through before riding commences; learning about horse behaviour; no alcohol use; safety stirrups; fall techniques; checking tack; use of ropes; equestrian courses; body protectors; and risk management.

Individually horse riders and handlers can strengthen their safety knowledge by adhering to the following recommendations and adjusting their behaviour to become more safety conscious.

5.1.1 Helmets

Wearing protective headgear decreases the frequency and severity of injury (Wolfenden 1992, Bixby-Hammett 1992), therefore the mandatory wearing of helmets could reduce injury rates (Bernhang & Winslett 1983, Pounder 1984, Ingemarson 1989, Bixby-Hammett 1990, AAP 1992, Nelson & Bixby-Hammett 1992, Hobbs 1994, Williams 1995, Young 1996, O'Farrell 1997, Sapien 2000, Bentley 2000, Holland 2001, Hockney & Miles 2001, Anthony-Tolbert 2002, Bixby-Hammett 2003, Lowe 2003, Otoupalik 2003-4).



Helmets should be fitted and secured by chin straps. Chin straps should not be elastic and should always be fastened so they do not move on impact (Pounder 1984, Whitlock

1987, Ingemarson 1989, Bixby-Hammett 1990, Bixby-Hammett 1992, AAP 1992; Nelson & Bixby-Hammett 1992, Brooks & Bixby-Hammett 1998, National Children's Centre 2000, Sorli 2000, Queensland Government 2001, Mansmann 2003, Australian Horse Industry Council 2003, Baker 2004, Broshek 2004). If a helmet fitted snugly it was likely to be twice as effective, although a loose fitting one was seen as better than none, providing it doesn't come off (Cole 1996).



Helmets that have sustained impact or are over 5 years old should be replaced (Baker 2004). Signs of aging are: squeeze clips with broken clips, harness pulling loose from helmet, white turning yellow, black velvet turning

beige, surface cracks or dents, chunks missing in interior, liner squashed down in place, shell or liner cracked (Malavase 1997). The outward appearance of the helmet could be deceiving so it is important to regularly inspect helmets as well as tack (Wingfield 1998). The helmet should be discarded after any fall or head injury (Nice 2001).

It is recommended that riders or horse handlers wear helmets while working around horses on the ground (Christey 1994, Williams 1995, Sapien 2000, Richard 2001) particularly young children who are working at a closer level to the horse hooves (Tevis 1997).



Face shields could significantly reduce facial injuries (Nice 2001, Exadaktylos 2002), particularly for sports such as polo where a projectile is added to the equation (Costa-Paz 1999).

Goggles have become popular in polo but they can not withstand the impact of the polo ball travelling at speeds up to 84 mph (Nice 2001). Helmets with face guards may protect face but will not protect against neck injuries (Nice 2001).

Helmet wearing was closely linked to companionship. It was suggested that once enough people include them as a vital part of riding attire for all mounted activities the continued increase in use would snowball. Peer and family pressure were considered one of the important factors in helmet wearing. If riders, teachers and professional riders wear helmets then those youngsters who look up to them will also do so (Probert 2001).

5.1.2 Safety stirrups



It is recommended that safety stirrups be used by most riders (Grossman 1978, Pounder 1984, Chitavis 1996, Finch & Watt 1996, National Children's Centre 2000, Sorli 2000, Griffin 2002, Australian Horse Industry Council 2003), particularly with small children learning to ride (Barone 1989) and inexperienced riders (Broshek 2004). There are different types of safety stirrups but their main aim is to release the foot when exposed to traction. (Gierup 1976, Barone 1989). Safety stirrups need to be fitted correctly so they can release the foot in the case of a fall (Ontario Horse Riding Safety Act 2001). If ordinary stirrups are used they should be fitted properly so the foot does not slide forwards through the stirrup (Nelson & Bixby-Hammett 1992).

5.1.3 Fall techniques

Teaching/learning fall techniques such as the 'tuck and roll' used by jockeys may minimise injuries (Goulden 1975, Pounder 1984, Mills 1989, Williams 1995; Finch & Watt 1996, Abu-Zidan 2003, Petridou 2004).

5.1.4 Checking tack



Tack should be checked regularly for wear and tear. Equipment should be well maintained and any pieces which are at risk replaced when necessary (Grossman 1978, Nelson & Bixby-Hammett 1992, Christey 1994,

Williams 1995, Day 1997, Bixby-Hammett 2000a, Jenkinson 2001, Anthony-Tolbert 2002, Australian Horse Industry Council 2003, Outdoor Recreation Centre 2004). It is recommended that riders do not buy cheap tack as it will not give have an adequate life span or have the required support (Anthony-Tolbert 2002).

5.1.5 First Aid

It was recommended that riders should learn CPR and first aid to help minimise injury (Mansmann 2003). This way they can provide secondary intervention if necessary.

5.1.6 The use of ropes, lead ropes or reins



Riders who had been caught by reins or ropes and dragged were severely injured. Riders should use protection such as non slip gloves when working around horses (Gierup 1976, Regan 1991, Williams 1995, Chitavis 1996, Grandin 1999, National Children's Centre 2000, Abu-Zidan 2003, Broshek 2004).

Ropes attached to horses should not be looped around the hand; they should be folded within the hand so that if a horse pulls backward suddenly no part of the hand will get

caught in the rope. Never tie a rope or reins attached to a horse to any part of the body.

5.1.7 Increased skill and knowledge

Increased skill level and knowledge should help prevent injuries (Finch & Watt 1996; Day 1997, Brooks & Bixby-Hammett 1998, Bixby-Hammett 2000a, Bentley 2001, Abu-Zidan 2003, Yurgil 2004). There were arguments for and against this theory. The literature suggests that proficiency for most riders comes after 100 to 200 hours of riding experience (Cripps 2000). Education on risk behaviours and potential risks was seen a primary prevention tool (Wolfenden 1992, Parry 1993, Broshek 2004). Major risk factors were seen as inexperience, unfamiliarity with horse, imperfect timing and the head forward stance of riding at speed (Broshek 2004).

However, it was argued that those with the greatest experience have the greatest number of accidents as they were performing more risky manoeuvres on the horse such as eventing, jumping or cross country and this group was also in need of education on risk (Bixby-Hammett 1992, Dekker 2004).

To further the knowledge base of riders the provision of courses and certificates in the equine industry such as the Certificate in Horse Racing are offered by the New Zealand Equine Academy, on behalf of the New Zealand Equine Education Trust (NZQA registered).

These are an example of some of the courses provided by the Equine Industry Training Organisation Inc (NZ) are:

- NATIONAL CERTIFICATE in Equine (Community Coach)
- NATIONAL CERTIFICATE in Equine (Farriery)
- NATIONAL CERTIFICATE in Equine (Grade 1 Coaching)
- NATIONAL CERTIFICATE in Equine (Introductory Skills)
- NATIONAL CERTIFICATE in Equine (Race Course Maintenance)
- NATIONAL CERTIFICATE in Equine (Race Course Management)
- NATIONAL CERTIFICATE in Equine (Racing Stable Management)
- NATIONAL CERTIFICATE in Equine (Thoroughbred Breeding)
- NATIONAL CERTIFICATE in Equine (RDA Coach)
- NATIONAL CERTIFICATE in Equine (Stable Practice)

- NATIONAL CERTIFICATE in Equine with strands in Breeding, Harness Racing, Sporthorse and Thoroughbred Racing.
- NATIONAL DIPLOMA in Equine (Farriery)

Recreational riders who use the road regularly could benefit from courses such as those provided by the BHS on Riding and Road safety. The program aimed to promote safety on the road by recognising riders who can show that they know the road rules, can obey the law, the Highway Code and the Pony Club or BHS riding and road safety manual. The course covered 5 weeks of theory – road rules, tack inspection, a simulated road route, and a practical road test (Pony Club 2004, BHS 2005).

Equi-Study and Warwickshire College in the UK have a Health and Safety with Horses program which was designed to encourage good practice in all equine environments. This course was designed because it was felt that many employers did not have the time to provide health and safety training. This was a work based training program which used the CD Rom 'Being Safer with horses' as part of the program.

5.1.8 Body protectors



Body protectors should be used where possible to minimise injury (Bixby-Hammett 1990, Nelson & Bixby-Hammett 1992, Brooks 1993, Whitlock 1993, Press 1995, Finch & Watt 1996, O'Farrell 1997, Jenkinson 2001, Griffin 2002, Lowe 2003, Baker 2004. Until 2004 there was only anecdotal evidence of the value of their protection (Turner 2002, Baker 2004) but it was recognised that using protectors has reduced the severity of injuries. Concerns had been raised by jockeys that the Australian type of protective vests (based on

the SATRA Standard 1998) may increase the risk of neck injury. But changes had been made to the vests in 1998 after a study by Gibson (1998) into the impact attenuation requirements: to allow a more flexible vest; to ensure adequate performance in wet and hot conditions; and to ensure a minimum of water retention in wet conditions.

Two vests were examined by McLean (2004) who found that the claims about the incidence of severe neck injury after the introduction of body protectors were unsubstantiated as there was no proof that any injuries were due to the vest. McLean also suggested that the concerns raised by jockeys over their stiffness limiting the ability to 'roll into a ball' were not supported by the evidence.

5.1.9 Lessons



A high frequency of injury was reported during lessons (Finch & Watt 1996). To safeguard against this it was recommended that riders receive up to 30 hours instruction on horse handling and basic instruction from certified teacher before riding unsupervised (Cripps 2000, Mansmann 2003, Abu-Zidan 2003). It was suggested that basic information, such as how to control and stop the horse, needs to be known/taught before the rider goes outside a confined area (Ingemarson 1989, Queensland Government 2002, Australian Horse Industry Council 2003, Outdoor Recreation Centre 2004).

To locate a good teacher, check out the qualifications of the teacher and the environment at the riding school. Is it safe? Is parking away from horses, is it clear of hazards, are the fences good and keep the horses with a designated area, are the gates maintained, does the riding school, and the instructor have first aid knowledge and emergency plan, do they match riders with horses, are lessons adapted to riders knowledge and experience? The facility should have a calm, knowledgeable and friendly feel to it (Dawson 2003/4).

5.1.10 Other protective clothing



It needs to be substantiated that the wearing of protective clothing improved safety before more riders would comply (Brooks & Bixby-Hammett 1998, Whitlock 1999). It was found that there were some safety precautions that are considered to decrease injuries, be it anecdotally, such as the wearing proper fitting boots with heels and smooth soles (Bixby-Hammett 1990, Chitavis

1996, Day 1997, Brooks & Bixby-Hammett 1998, Grandin 1999, Sorli 2000, Bixby-Hammett 2000a, Jenkinson 2001, Petridou 2004) as this prevents the boot slipping forward in the stirrups and getting caught in the case of a fall.



EQUITECTOR
BALANCE SYSTEM

Most riders battle daily to keep their feet in the correct position in the stirrup iron.

This is because almost all riding footwear is balanced as fashion footwear with the point of gravity behind the ball of the foot.

This may be ideal for walking but whilst in the saddle, even with applying excessive pressure, it makes it difficult to keep the foot in the stirrup iron. The imbalance forces the boot to slip out.

The **EASY RIDER** balance system has aligned the heel of the foot inside the boot with the strike plate of the stirrup iron.



Heel position Stirrup iron strike plate

Irrespective of the leg position and without applying any undue pressure the alignment is maintained and the foot will stay in the correct position in the stirrup iron naturally.

The rider can now take her/his mind of the feet and apply the energy conserved to better use.

For Further information:-

SHICO
Industrial Footwear Ltd
Tel 01933 273800
email sales@shico.co.uk

It was recommended that appropriate footwear and clothing should also be worn when working unmounted around horses (Australian Horse Industry Council 2003). There has been a decrease in foot and ankle injuries and it was suggested that changes in footwear when working around horses may be the reason (Carr 2001).

There were some areas which need further investigation such as the suggestion about riders using wrist protectors, like those used in preventing snowboarding injuries, because of the recent increase in arm and wrist injuries (Moss 2002). It was also suggested that elbow and knee padding would reduce injuries during falls

(Bentley 2000). However, the interventions could restrict the fine movement of the arms and wrist required to keep control while horse riding (Northey 2003).

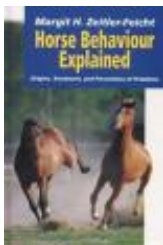
5.1.11 Matching horse with rider



New riders should be placed with older more bomb proof horses (Ingemarson 1989, AAP 1992, Christey 1994, Williams 1995, Sapien 2000, Lamb 2000, Anthony-Tolbert 2002, Queensland Government 2002, Abu-Zidan 2003).

More advanced riders needed to be aware of the suitability of mounts for specific activities (Carr 2001), of particular concern was the selection criteria of horses used for jumping at US Pony Clubs as 38% of injuries were reported during jumping (Baker 2004).

5.1.12 Horse behaviour



Riders should learn about horse behaviour, be disciplined around horses, and learn quiet handling techniques (Ingemarson 1989, Williams 1995, Thompson 1996, Grandin 1999, Bixby-Hammett 2000, Abu-Zidan 2003). Those working with horses should be properly trained in the knowledge of horse behaviour and know what safety precautions to take when working within confined spaces such as stables or by fences (Iba 2001).

Beware of working around back legs of horse. Horses have blind spots and they should always be aware of where the handler is at all times as they may bolt or move quickly (Williams 1995). Isolate horses from others while working around them by minimising uncontrolled interaction of things such as vehicles, other horses, and dogs (Williams 1995, Day 1997, Australian Horse Industry Council 2003, Abu-Zidan 2003).

Bags or camera should not be carried while riding as they might fly around and scare the horse, loose flapping clothes may also scare the horse (Queensland Government 2001).

5.1.13 Pregnancy

Provided the pregnant woman was aware of the risks involved, the decision to ride remains with the rider. However, for events such as show jumping or cross country pregnant women should be discouraged from participating (Rogers [2004])

5.1.14 Alcohol and drugs

There should be no alcohol drunk or drugs taken while riding or working with horses as it may lengthen reaction time and reduce the rider's ability to control the horse (Christey 1994, Finch & Watt 1996, Bixby-Hammett 2000, Gray 2000, Mansmann 2003).

5.2 Promoting Community Education



A well coordinated multidisciplinary campaign raised community awareness (Cohen & Swift 1993). Community education was broadly targeted at groups of the population at large. The community approach to prevention aimed to educate through the provision of information and resources to the broader community. This was done through mass campaigns such as

media campaigns which increased awareness, changed attitudes and provided a context for other strategies such as public policy change to succeed.

Recommendations included: A physician at ED talking to a group of riders about the effects of concussion and traumatic brain injury and how to prevent or minimise risk through wearing a helmet; provision of community resources; targeted programs; role models; safety programs describing the correct way to wear a helmet; a community coalition promoting and conducting an incentive program in collaboration with law enforcement on the practice of safe riding on public roads.

The development of community based injury prevention programs has become an accepted strategy among safety promotion specialists for the past three decades, many of these are using the WHO safe community model as a basis for their programs. This model enables the use of multiple strategies and can target all age groups, environments and situations (Nilsen 2004). It was recommended that community interventions would work better in cohesive, stable and isolated communities such as rural farming communities when they were tailored to address the unique

community characteristics and also when they have a degree of duration and intensity (Nilson 2004).

5.2.1 Safety education

Education was seen as the single most effective way of reducing injuries (Roe 2003). Education programs such as those provided by most Pony Clubs and the 4-H horseless project educated riders on risk management (AAP 1992, Buckley 1993, Finch & Watt 1996, Tevis 1997, Griffin 2002, Washington State University 2003, Swinkler 2004, Petridou 2004). It was recommended that where these programs do not exist they could be run through schools. Safety programmes could also be channelled through lessons and riding schools (BRC Marketing & Social Research 2004).

An example of this method of intervention was an educational program piloted in a school in Australia which examined safety knowledge, attitude and behaviour. The study determined that a more systematic experimental education was needed for rural children who did not attend pony club programs. They suggested an amendment to the program could be to involve retailers and manufacturers of protective devices in promotional activities which could provide discount arrangements for helmets and boots (Lower & Wolfenden 1995).

Safety helmet promotion programs (Wolfenden 1992, Bergman 1995, Lamb 2000, Lamb 2003, Mansmann 2003), such as the Safekids and the 4-H youth program, where cheap helmets for riders were sponsored or subsidised by groups was found to be successful in increasing helmet use. These programs worked on the rider's risk perception to enable them to understand the need to wear helmets (Condie 1993, Lamb 2000). The success of a helmet program was in its ability to sell the idea to riders that products are available that are safe, well designed and inviting to look at (Lamb 2000).

Programs should teach safety precautions for both riding and for when working around horses (Barone 1989). Lamm (2001) suggested that a good program should cover understanding horse behaviour, particularly in relation to horse kicks, include an overview of the problem, and should work through a progression of presentations on topics such as horse handling, prevention and problem solving, emergency first aid and how the local emergency services operate. These workshops should involve real people and horses.

Another example was a pilot equestrian first aid and safety program was run in 2002 by University of Vermont for UVM Equine students. This program was geared specifically towards a first aid certificate geared to the equestrian to become certificated in First aid and CPR. This was a collaborated program with local American Red Cross instructors (Green 2002/3).

5.2.2 Resources and Information

Guides and manuals such as those produced by US Pony Clubs and the 4-H organisation are useful tools for community education programs. The provision of lists of contacts, websites, fact sheets with up to date epidemiology as well as injury prevention methodology are valuable tools. These resources, fact sheets and guidelines are essential tools for local clubs and other organisations interested in promoting helmet use (Bergman 1995).

5.2.3 Farming/ horse or animal injuries programs

Farm action groups needed to develop local health promotion initiatives aimed at targets such as the three H's – horses, helmets and hearing. A checklist of environmental hazards was a useful way to educate farm families about the potential hazards and risk behaviours on their farms. A key factor to success was the relevance to community. It was vital to include both professional health staff and the target

population in the design of the checklist. The checklist has value as a component in behaviour and environment change strategies. (Wolfenden 1992).

There was also a need for parental schemes and involvement in programs (Williams 1995, Farmsafe Australia 1999, Yurgil 2004). Parents can help children to identify risks and perform their own risk assessment (Farmsafe Australia 1999).

Campaigns to educate about farm injuries need to stress the risks of riding horses and explore the potential for more helmet use through building community safety action groups based around existing community groups (Marshall 1996).

Those farming and working around horses such as at rodeo and cowboys needed to be less macho and wear helmets. The challenge was to develop a program to educate farmers and persuade them to wear safety equipment (Sorli 1998b, Petridou 2004). Farmers also needed information on the how to devise safety plans and establish emergency procedures in case horse related injuries occur. This included the provision of first aid training and first kits (Wolfenden 1992, Carr 2001).

The role of women on farms was examined and it was felt that women's perception of their role was a duty of care and it was considered that they provided a major role in reinforcing safety messages. Unfortunately their zone of influence was restricted to where the parties could be seen. However, the analysis identified four safety roles – education, supervising, managing risks and engaging in safe practice. Women also tended to be the first aiders and often had safety plans established in case of injuries (Shaw 2003).

5.2.4 Targeted programs

The successful program aimed at children had seen a decrease in injuries for children under 13 (Bixby-Hammett 1992, Sorli 1998b). So, programs and media campaigns

should be targeted at those most at risk, which are young girls and youth (Bernhang 1983, Barone 1989, Chitavis 1996, Bixby-Hammett 2000a, Yurgil 2004, BRC Marketing & Social Research 2004). It was suggested that it would be appropriate to target females through sport and recreational organised equestrian bodies as this is where they participate most (Hockney & Miles 2001).

Programs for youth involved in farming should include instruction on the use of safe practices when working around cattle and horses. It was important that programs were well designed and age appropriate, and that the stakeholder population needed to be involved in program design. A recent study of secondary school pupils showed that they needed instruction to heighten awareness as they reported a very low level of understanding of safe practices (Joeger 2000).

There were other groups could be targeted. A study by Northey in 2003 found an interesting trend relating to Maori when results are juxtaposed with those of other ethnic groups where females always predominated. Within Maori those most at risk were found to be Maori males in rural areas. In this instance programs would be need to be through community education or be marae based.

The Canadian Agricultural Surveillance program investigated injury on farms and reported that when examining farm safety the entire family needs to be taken into account as all are exposed to the work environment (Dimich-Ward 2003). Rural communities would need to be targeted through community networks.

5.2.5 Role models

Young people needed role models and mentors who ride safely and set a good example (National Children's Centre 2000). Riding behaviour and ideology is formed early so riders need to establish safe riding habits such as the wearing of helmets. It was found that younger equestrians

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

are more likely to wear approved headgear if their friends and family also wear them (Probert 1999).

5.3 Educating Providers

Prevention programs needed the cooperation and help of health and safety professionals and other key persons in the community that have regular contact with people at risk and can help encourage adoption of safe behaviours (Cohen & Swift 1999). Training providers means educating those who influence others working in the injury prevention arena, whether they are professionals, paraprofessionals, community activists or peers. It is critical to ensure that those who provide training, advice, or serve as role models have the information, skills, and motivation to effectively promote injury prevention with youth, parents, colleagues, and policy makers. These committed individuals could help improve community education, change policies within their institutions or organizations and advocate for legislation.

Providers had the expertise and the opportunity to inform patients and colleagues so it was essential that they received the education to improve their knowledge and understanding of injury prevention. The medical profession in particular could also be advocates for policy change. Recommendations include; paediatricians and family physicians being training to demonstrate proper use of helmets and instructing on safe riding behaviour; law enforcement trained in incentive programs for helmet use and safe riding behaviour in public place; local service club members and schools trained to conduct annual bulk helmet purchase campaigns; helmet sales staff receiving training on risks of head injuries and trained in guidelines for the proper fitting of helmets; and health and safety officers reinforcing legislative requirements and targeting areas of need.

5.3.1 Education

It was recommended that conferences or workshops be held for doctors, nurses and health care professionals on the

outcomes of horse-related injuries (Barone 1989, Nelson & Bixby-Hammett 1992, Hobbs 1994; Brooks & Bixby-Hammett 1998, Yurgil 2004). They could be part of programs designed for risk awareness for those who work in the horse industry. It was suggested that both medical professionals and equine industry management could play leadership roles in injury prevention programs (Iba 2001). Paediatricians could encourage horse safety training and helmet wearing (Nelson & Bixby-Hammett 199, Christey 1994). Physicians needed to be aware of the possibility of high level of stomach injuries in child riders and examine them carefully.

5.3.2 Health & Safety

An overview of farm related unintentional injuries identified animal and horse related injuries as amongst the top five leading causes of farming injuries to children and adults. Therefore a systematic and industry wide approach towards the elimination of farm injuries is the most likely to yield benefits. An example of this approach was found in Australia where Farmsafe NSW and the NSW Department of Health had developed health promotion packages that provided resources and mini grants for farm safety interventions for rural health services (Frankin & Crosby 2002). It was considered very important to educate the trainers to provide the best advice and to encourage the adoption of safe behaviours.

Farmers should be provided with resources which educate them and their families about risk factors and risk prevention (Day 1997). It was reported that 95% of farm injuries were to farmers and their families (Kelsey 1994) not their employees. Farmsafe NSW and WorkCover NSW developed a farm package called Future Farmers that provides material and guidance on how to run a field day to introduce Year 9 and 10 agricultural students to hazards on farms and safe work practices (Farmsafe NSW 2001, Franklin & Crosby 2002). The package included a module on horse safety on farms which covered: identification of hazards associated with horses on farms, a description of strategies for safe use

of horses on farms, and the ability to correctly select and wear appropriate personal protective equipment (PPE).

There was wide support for farm management systems. The Managing Farm Safety course, supported by the Farm Health and Safety Joint Research Venture, provided participants with a package of farm OHS management resources that were developed by the Joint Research Venture. The course included: checklists, health and safety guidance notes, a worker training register and induction sheets. (R&D Plan for Farm Health & Safety 2002, Franklin & Crosby 2002).

Providers should distribute workplace audits and checklists for new employees which included an extensive safety induction program (Racing NSW OSH Manual 2003). In New Zealand ACC WorkSafe provided resources and kits on how to reduce injuries in the rural environment. These provide hazard identification, injury event models, injury risk factors, and strategies to use to reduce injury risk, safety plan checklist and new employee induction checklist (ACC 2001, 2001a, 2001b, 2002).

Risk management policies in Australia instruct the equine industry to identify risk, evaluate and prioritise risk, manage risk, avoid risk and minimise risk (Sherlock 2002) by doing so hope to reduce the number of insurance claims. They ask three basic questions: What can go wrong? What can we do to prevent it? What will we do if it happens? And instruct how to set up risk management policies which can be adopted by equine organisations.

WorkCover Australia funded a 'Train the Trainer' Project with Racing NSW. This project was an OSH training program specifically for horse trainers. The aim of the program was to increase the capability of the equine industry to apply a preventive approach to workplace health and safety systems (Racing NSW 2005).

5.4 Fostering Coalitions and Networks

A coalition is a union of people and organizations working to influence outcomes on a specific problem (Cohen & Swift 1999). Coalitions were useful for accomplishing a broad range of goals that reach beyond the capacity of any individual member organization. These goals ranged from information sharing to coordination of services, from community education to advocacy for major environmental or policy (regulatory) changes. Coalitions and partnership were an essential part of injury prevention as they maximised resources and reduced overheads. They were a critical aspect of effective community injury prevention because they draw on the knowledge and resources of a diverse group.

Recommendations are: Parents, riders and school administrators forming a coalition to find solutions to injuries to riders in rural areas; A Safe Communities Coalition to identify problems to riders on public roads and other road safety campaigns; Safekids helmet campaigns with local riding clubs; Resources; Insurance providers such as ACC working with community groups and the equine industry to produce information kits on best practice for horse riders to lower insurance levies.

CHARACTERISTICS OF COLLABORATIVE ORGANIZATIONS

Advisory Committees generally respond to organizations or programs by providing suggestions and technical assistance.

Commissions usually consist of citizens appointed by official bodies.

Consortia and Alliances tend to be semi-official, membership organizations. They typically have broad policy-oriented goals and may span large geographic areas. They usually consist of organizations and coalitions as opposed to individuals.

Networks are generally loose-knit groups formed primarily for the purpose of resource and information sharing.

Task Forces most often come together to accomplish a specific series of activities, often at the request of an overseeing body

5.4.1 Helmet campaigns

National Children's Centre (2000) suggested the need for co-operation between agencies in areas such as helmet campaigns which increased access to helmets by selling at a discount (Bergman 1995), the provision of education on supervision of riders, parental involvement and guidelines for the selection of a suitable mount. An example of this was Safekids support for a 4-H Youth helmet program where children are sponsored in the purchase of a helmet (Lamb 2000).

5.4.2 Road safety campaigns



Coalitions between safety groups/advocates, traffic enforcement and local councils on the use of horse on the roads were seen as very effective. They produced information on road use and education for both riders and drivers such as how to cross the road and riding safely in groups (single file), where it is safe to ride and the rules in relation to passing horse on roadways (Queensland Government 2001). The UK Government have introduced road strategies *Tomorrow's roads – safer for everyone, The first three year review* (DFT 2004a) and also *Road safety and good practice guide* (DFT 2004b) which recognises the needs of equestrians as vulnerable road users similar to cyclists and pedestrians. These rules were also aimed at educating drivers.

Local Councils in the UK have been collaborating with road transport departments in equestrian strategies which will enable horses to be ridden safely on bridleways, and all purpose highways without motor vehicles, and on the margins of state highways (Bath & North East Somerset 2005, Redcar & Cleveland Borough Council 2005)

Coalitions or partnerships have been established between the British Horse Society and the police, The Parliamentary



Advisory Council for Transport safety (PACTS), British Standards (BSI), Roadsafes, Driving Standards Association (DSA), LARSOA, and the Department of Transport (DfT) which produced such things as: a poster by the British police called "Don't be a dark horse" which publicises the need for wearing fluorescent of reflective clothing while riding on the roads (particularly in the dark); a fluorescent rug used by the Merseyside Police force with their horses was adopted by the BHS and sold at events; the DfT campaign: "Horse sense for motorists" saw posters and pamphlets distributed to motorists; a partnership with the DSA

produced a separate section in the Highway code on horses on the road. The training programs established by the BHS for a riding and road test have been a major step forward in safety awareness. The program was used in Britain and Germany, and in Britain over 7,000 riders participate and sit the test (British Horse Society 2005).

5.4.3 Resources – video and manuals

Collaboration between American Association for Horsemanship Safety, the USPC and Washington 4-H Foundation saw the production and distribute the *Every Time, Every Ride* video to encourage helmet use (Malavase 1998).

Another video produced for 4-H was *Ground handling horses safely* which included a facilitator guide. The 4-H group also produced the *4 Horse safety resources* (2004) which listed resources, books and manuals, safety websites and protective headgear information, newsletters and safety posters.

5.4.4 Safety stirrups

Bostock Developments and RMIT University have collaborated to develop the Breakaway stirrup (RMIT 2001). The stirrup was designed for use in all disciplines and won an award in 2003. The unique feature of the stirrup was that it had mechanisms that open in both directions, which is why it differs from the standards stirrup (RMIT 2003). Another safety stirrup is the STI breakaway stirrup which releases after 72° backward angle, or a 45° forward angle and takes 8lbs of torsion pressure to move the springs, and rotate the stirrup about the stirrup leather.

5.4.5 Insurance providers

Coalitions have been established between insurers and equine industry to strategise on best practice may help eliminate high insurance overheads within the industry. The California Horsemen's Safety Alliance (CHSA) is working with AIG, the industry workers' compensation insurance provider, to create an extensive safety program for backstretch workers and exercise riders. The program began with the creation of new on-track safety rules. In the near future, CHSA members would also be provide with a newly created safety video aimed specifically at working around horses. Viewing of the safety video would be part of the licensing process for stable area occupations, such as grooms, exercise riders, hot walkers, and pony riders. CHSA and AIG were also producing a safety manual that will be distributed to all insured members. These and additional programs will help to prevent injuries and would work towards keeping insurance costs down. (California Thoroughbred Trainers 2004)

The British Horse Society has been working with insurers to get premiums down. The agreement was that employers must hold courses on safety and adopt proper risk management procedures. Part of the risk management would be record keeping with accident reports, emergency contact details and guidance notes, horse work records, training and incident reports, staff training records, riding equipment register and maintenance forms, and riding student appraisals (Berens 2005).

In New Zealand there has been consultation between the NZTA and ACC over the ACC rates for employers which has resulted in the proposal of a reduction in the employer's rates for the Levy Risk Group of 39.9% from the rates in 2004-5. The expected increased rate for self employed of \$14.49 was in fact only a rise from \$11.30 to \$11.93. The NZTA was currently working with ACC on a safe work practices document (TBA 2004).

The US horse racing industry continued to struggle with problems associated with workers' compensation insurance. The Horse Racing Industry and Workers Compensation Task Force Report cited as its third objective the need to develop an education program for safe industry practices (Allen 2003). They suggested that the industry needed a national racing industry accident reporting system which could be modelled on systems used by the Department of Transport across the country for highway accidents and could be used as a tool to negotiate or determine appropriate insurance rates. They also recommended the development of an employee safety standards manual incorporating a set of 'best practices' which would become incorporated into existing NAPRA/ARCI Model Rules. They also recommended the development of a national training program such as the national vocational racing schools found overseas.

5.5 Changing Organisational Practices

Changing organisational practices involved adopting regulations and shaping norms to improve communities and to create new models (Cohen & Swift 1999). Organisations can change internal regulations and norms to safe guard the health and safety of their members.

Recommendations include: The adoption of safe industry models; leadership from equestrian regulatory organisations; safety committees; tertiary medial care; supervision the mandatory wearing of protective clothing; the adoption of a national training program; risk management policies; health and safety guidelines, or risk management guidelines; accreditation; certification of teachers; environmental modification; and a code of practice.

The influence on the safety of competitors and the public by the Jockey Club was seen to be considerable and it was suggested that other governing bodies and organisations should emulate their procedures (Parry 1993). The Equestrian Federation of Australia also has a major role in setting standards and educating members and the public in matters relating to horse safety this practice should be duplicated in other high profile equine organisations (EFA 2003). In 2003 the New Zealand Racing Board (NZRB) was established to replace the 1971 Racing Act and the New Zealand Racing Industry Board. Its key function was to initiate and develop policies for the three Racing Industry codes. Their responsibilities were the monitoring and improving the rules of racing enacted by each of the codes. This could be expanded to include safety initiatives.

5.5.1 Leadership from equestrian regulatory organisations

It was stressed that leadership from equestrian regulatory organisations was necessary because an increase in injuries during sport had established a need to design regulations and rules to improve safety (Lower & Wolfenden 1995, Bixby-Hammett 1998, Brooks & Bixby-Hammett 1998).

Examples of some of the changes in organisational practices were located in organisational publications such as manuals and handbooks with guidelines on hazard and identification. Some of the changes to practices and rules are shown in the following Australasian organisations:

Equestrian Federation of Australia (EFA). The EFA produced a series of safety and risk management guides for members. They suggested that the provision of risk management programs should help bring down insurance premiums and reduce the frequency of claims. The guides suggested changing practices to incorporate such program and the production of checklist to enable event organisers to do their own risk management of the venue.

New Zealand Equestrian Federation. The Health and safety handbook recognises the need to have greater awareness of health and safety issues with the orientation and risk management identification checklist. There is also an event site preparation and checklist.

Australian Harness Racing Council made changes to the requirements to wearing protective vests in 1998. They are based on the SATRA Jockey Vest standard-Version M6 1997 and the approval of the drivers' protective vests is the BETA 2000 Standard introduced in August 2004.

NSW.Thoroughbred Racing Board (Racing NSW) Occupational Health and Safety and injury management manual (2003). The manual was produced to help manage an Occupational Health Safety and Injury Management system. The manual provides extensive lists, forms and guidelines for employers and employees on risk management and workplace injury management programs.

5.5.2 Helmets

The mandatory wearing of helmets has been an issue for a long time (Bernhang & Winslett 1983, Pounder 1984). Many equestrian groups such as horse racing, horse and pony trials and show jumping governing bodies have already introduced mandatory wearing of helmets within their rules for competitions. However, there was still some groups who are “fashion bound’ who would not wear standard approved safety helmets (Parry 1993).

Sponsors of events should require the wearing of appropriate headgear (Christey 1994, Lower & Wolfenden 1995). Pressure should be brought on equestrian organisers to adopt mandates for helmets and prohibit those who do not wear them (Probert 2001). The media and equestrian organisation could support the practice by only publish photographs of competitors who are wearing their headgear (Probert 2001).

5.5.3 Safety Committees

Safety Committee should be established within equine organisations to assist to review injuries and implement appropriate rules and guidelines (Bixby-Hammett 2000a, Yurgil 2004). The input of a physician should be sought by Safety Committees (Nelson & Bixby-Hammett 1992).

5.5.4 Supervision

Children riding in groups without an instructor constitute a high risk (Gierup 1976, Wolfenden 1992). Children under 6 should not ride unsupervised (Nelson & Bixby-Hammett 1992, Sapien 2000). In trekking or riding establishments there should be supervision at all times and a ratio of 5:1 has been suggested for unskilled riders (Gierup 1976, Grossman 1978, AAP 1992, Bentley 2001, Ministry of Agriculture 2002, Griffin 2002, Australian Horse Industry Council 2003, Outdoor Recreation Centre 2004). Because of the high risk for youth there should be supervision of youth working around animals (Hendrick 2001).

5.5.5 Tertiary medical care

Riders need to be examined before returning to the saddle after an injury to protect themselves against their own enthusiasm (Goulden 1975, Whitlock 1987, Sorli 1998a). There is a need to establish a grading of injury in relation to return to sport especially after concussions (Bixby-Hammett 2000b. Concussion is a mild traumatic brain injury and should be treated carefully (Broshek 2001, Broshek 2004). The old saying that after a fall you should get right back on is the worst possible advice for an equestrian with a head injury.

There was a need to address the mandatory retirement of competitors who sustain multiple concussions (Lowe 2003). At race tracks in UK and Ireland all jockeys have injury books which must be examined by race medical officer before they are declared fit for riding, all injuries are recorded on a sheet and sent to the chief medical officer of the licensing authority (Turner 2002).

It was suggested that equestrian organisations and youth groups such as pony clubs should consider obtaining baseline neurocognitive screening and establish a consultative relationship with a neuropsychologist as part of a comprehensive and proactive concussion management program (Broshek 2001).

There should be the provision of properly qualified first aiders at all events, riding schools, trekking and sports such as polo (Parry 1993, Costa-Paz 1999, Sorli 2000, Bixby-Hammett 2000b, Griffin 2002, Australian Horse Industry Council 2003). Every race meeting should have at least two trained medical doctors on hand (Turner 2002). Medical teams should be prepared for high energy 'ballistic' injuries (Jenkinson 2001). Event medical teams should have experience in managing severe trauma and there should be appropriate emergency equipment available for resuscitation and spinal and fracture immobilisation. Protocol for dealing with potential cervical injury is essential for the prevention of further injury. It was recommended that only after radiographs have been obtained should the helmet or shoulder pads be removed or cut off (Waninger 2004). Evacuation details should be established as many events are held in rural areas, such as whether the patient is to be taken by air or road transportation.

5.5.6 Risk management

ACC Thinksafe (2005) has produced a Health and Safety Starter pack which encompasses risk management procedures and checklists for equestrian organisations to adopt. It includes hazard management and training and provides forms for emergencies and incident investigation, which can be used as a basis for injury surveillance data collection.

5.5.7 Code of practice/guidelines

Riding establishments, riding and trekking establishments should have an industry recommended code of practice or guidelines (Beeton 1999, Bentley 2000, Lievens 2001, Abu-Zidan 2003, Roe 2003, Outdoor Recreation Centre 2004). Best practice guidelines for those involved in all parts of the horse industry was seen as important for riders and equipment, and included the premises, and all operations around the events (Australian Horse Industry Council 1993). They should include all areas of risk management and strategies for injuries to minimise the likelihood of injury or loss (Outdoor Recreation Centre 2004). An outline of the responsibilities of supervisors, the provision of competent staff, safe equipment, environment and conduct was recommended (Outdoor Recreation Centre 2004). This included a checklist as a measurement tool to gauge the impact of prevention initiatives aimed at risk reduction (Wolfenden 1992).

5.5.8 Accreditation

Accreditation or licensing of riding schools and horse lease establishments was deemed very important (Williams 1995, Finch & Watt 1996, Hockney & Miles 2001, Australian Horse Riding Centres 2002, Abu-Zidan 2003, Roe 2003). It was recommended that riding establishments and schools should keep records be kept of each horse and any incidents which occur (Association for Horsemanship Safety and Education in Australia 2004)

Accreditation should be based on the adherence to strict guidelines which include safety rules such as that no one under 18 should ride without a helmet, hard soled shoes or tack properly fitted (Ontario Horse Riding Safety Act 2001.).

It is suggested that guides at trekking establishments should be over 16 years of age and the ratio should be 5:1 for riders and supervisors (Ministry of Agriculture 2002). They should ensure that all riders have access to correctly fitted standard approved helmets and that they wear smooth soled shoes or boots to prevent the foot sliding forwards (Ministry of Agriculture 2002).

5.5.9 Certification of teachers

Certification of teachers was considered very important (Nelson & Bixby-Hammett 1992, Brooks & Bixby-Hammett 1998, Cripps 2000, Bentley 2001, Outdoor Recreation Centre 2004) and all instructors should be over 21 (Association for Horsemanship Safety and Education in Australia 2004). All instructors should be qualified on how to avoid accidents (Niskanen 1994). The instructor's certification should include first aid and CPR certification (Lowe 2003).

Instructors were often chosen on availability and their salesmanship rather than their ability to teach or their skills in horsemanship. An instructor should be chosen on the accident rate of his or her students, both those riding under supervision and those riding separately (Bixby-Hammett 1997).

5.5.10 Environmental modification and checklist

On farms, structural modifications could be made to barns to limit animal interaction by those working with them (Hendrick 2001). *The self guided horse facility analysis: a proactive safety education tool for equine facilities* was written to provide stable owners and users with a guide to evaluate and enable them to make environmental changes to their facilities. Designed as a checklist the guide identified

problems, and provided solutions to improve safety through structural or procedural changes (Greene & Trott 2004).

Environmental modifications have been seen to lessen the severity of injuries (Finch & Watt 1996), such as at race tracks where changes have been made by having plastic rather than wooden rails (Pounder 1984, Press 1995, Waller 2000), the use of extra padding or altering of the shape of rails at starting gates (Press 1995, Waller 2000), or the use of frangible fencing on cross country events (Lowe 2003, Elliot 2003).

Horse hire establishments need to check the surroundings before sending groups out. Risk factors such as slippery ground and bad terrain could then be avoided (Ingemarson 1989, Williams 1995, Bentley 2000, Outdoor Recreation Centre 2004).

5.5.11 Protective clothing

Riding establishments should provide proper footwear as well as helmets (Queensland Government 2001) as many clients are unaware of the type of footwear necessary to ride. The provision of the proper safety clothing, such as helmets and boots, should be as intrinsic as providing climbing ropes for mountaineering.

5.5.12 Alcohol and drugs

NZ Thoroughbred Racing has a strictly policed 'drug free' policy in relation to riders at race meetings and trials held at venues which are operated by registered racing clubs. The use of alcohol and amphetamines by riders has become a major concern and necessitated the introduction of rules and penalties in relation to testing positive for drugs in 1995. (McKenzie 2006)

5.5.13 Properly trained horses

Carefully selected horses should be provided at riding schools. They should be ridden regularly, be older more 'bomb' proof or tested horses, and be in good condition (Brooks & Bixby-Hammett 1998, Outdoor Recreation Centre 2004).

5.6 Influencing Policy and Legislation

Cohen & Swift (1999) state that the provision of local and national laws, as well as the adaptation of guidelines and policies affects the largest numbers of people. So, requiring safe practices, implementing safety standards, and encouraging the use of safety equipment could prevent unintentional injuries. Legislating policy represents perhaps the strongest and broadest means of bringing about environmental changes to decrease the incidence of injury, disability and death.

Recommendations included: Legislation covering the standardisation of helmets; research on new helmet design and on protectors and vests; organisations and clubs adopting, implementing and enforcing a helmet use policy and initiating a helmet distribution program; organisations such as Safekids working with the equine industry to help pass legislation requiring all persons under 16 to wear standard approved helmets while riding; national guidelines or codes for riding schools; injury prevention advocates working towards universal helmet legislation for all riders similar to bike helmet legislation; injury surveillance data collection; health and safety legislation.

Few countries in the world have introduced legislation directly related to equine/equestrian safety. To date segments of equine safety legislation are found within Health and Safety Acts, Environmental and Road Safety Legislation.

In 2001 the Ontario Horse Riding Act was introduced to provide safety in horse riding establishment. It set out the legal responsibilities of the establishment which included that no one under 18 should ride without an approved helmet, hard soled footwear or tack properly fitted to the horse. It also outlined some footwear exemptions in relation to the use of properly functioning and sized hooded stirrup and safety stirrups.

In 2000 a helmet statute was passed in New York which required the wearing of approved helmets by riders under 14 years while on the road, and during horse hire and lessons (Malavase 2001). It also required horse providers to provide helmets to all riders under 14 years and to beginner riders. The City of Plantation, Florida enacted a municipal ordinance in 1999 which contained similar requirements for riders under 16. In 2004 the Christen O'Donnell Equestrian Helmet Safety Act was introduced in the US to encourage and ensure the use of safe equestrian helmets. This established grants for groups to work towards helmet safety campaigns.

Recommendations for regulation cover the following:

5.6.1 Helmets:



Many researchers have indicated the need for mandatory wearing of helmets. The need to protect the head was heightened by the fact that riders may have double impact, once when the head hits the ground and then again if the rider gets kicked or trampled by the horse. It was suggested that legislation such as that used for bike helmets would be appropriate (Broshek 2001)



Researchers stressed that the proper design of helmets was important. In 1979 the United States Pony Club set a target to develop standards, and to aid the design of a small, lighter and more comfortable helmet. During the last decade this has happened and helmets are now being produced in a variety of colours (Lamb 2000).

It was considered important to have international standards for the production of helmets as some riders have been injured while wearing helmets which did not provide sufficient protection against head injuries (Gierup 1976, Grossman 1978, Whitlock 1987, Ingemarson 1989; Thompson 1996, Day 1997, Standards Australian 1998, Bixby-Hammett 2000, Bixby-Hammett 2000a, Lamb 2000, Jenkinson 2001, Griffin 2002, Yurgil 2004). Helmets should have an outer concussion

preventive layer and inner layers that effectively add to their energy absorbing capacity (Abu-Zidan 2003).



There has been criticism to date that helmets have not been correctly designed to lessen injury and that more work is needed to ensure best design for best outcome (Niskanen 1994). For instance, helmets are not designed to take rotational elements of head injury (Whitlock 1999). It has been accepted that approved helmets absorb more of the force helping to decrease the velocity of impact than non approved caps (Wingfield 1998).

An examination of helmet standards showed that the ASTM was the toughest overall along with BSI. A/NZ standards had good head coverage but tests noted caution for their use in other countries under other weather conditions (Biokinetics 2000) The new Australian standard provides a guide for helmet use during different disciplines and a list of aids for the selection of standard approved helmets – style, peaks, colour, ventilation, size and fit plus comfort (EFA 2003).

It was suggested that the most commonly used helmet was designed for style rather than protection and secured by a thin chin strap (Ghosh 2000) Modification was needed for particular sports such as racing (Press 1995). Reasons for non-use have been given as inadequate helmet design, expense, discomfort and inappropriate for some riding styles (Bergman 1995). Some of these issues are now being addressed such as the production of light weight ones which provide ventilation with gore liners to dissipate perspiration (Tevis 1997), and also interchangeable covers and styles such as western, traditional velvet, lycra and nylon (Tevis 1997). Changing the cost and style of helmets seen as imperative (Condie 1993) as input from riders was needed because manufacturers did not seem to recognise the

inherent problems with existing headgear and were therefore not adapting them to suit rider's needs (Condie 1993).



The high number of concussion during racing may signify a need for a differently designed helmet or headgear (Mills 1989, Press 1995, Waller 2000). It was recommended that improving technology to create a lightweight helmet with better cover may provide more protection (Waller 2000).

It was also suggested that use of helmets on public road should become a regulatory issue (Richard 2001). Although researchers conceded that compliance and enforcement of helmet use would be a major issue.

5.6.2 Protectors or vests



To provide the best protection protectors need to conform to an international standard (Turner 2002). The protector was designed to reduce soft tissue or provide a small amount of protection to the chest and small during a fall or kick (Whitlock 1999, Turner 2002). Comfort was seen as a high priority plus the ability to mould to the skin and allow movement. Research was needed on using less rigid material (Whitlock 1993).

Shoulder pads have been recently added and anecdotal evidence shows that they are effective (Whitlock 1999). It was suggested from the number of kick injuries sustained in the stables that the wearing of protective vest may be an appropriate prevention solution (Iba 2001).



Wearing of flak jacket or vests for jockeys and racing was already mandatory (Press 1995, Waller 2001). Although there had been

criticism of some vests by Australian jockeys who suggested that they may increase the risk of neck injury because they could not use the tuck and roll falling technique. However, their criticisms were evaluated and it was reported that the vests tested were not rigid/stiff enough to prevent the body being rolled into a ball and prevent the falling technique (McLean 2004)

5.6.3 National guidelines or codes for riding schools

National guidelines or codes of practice should be required to regulate riding schools and the equine industry (Pounder 1984, Bentley 2001, Australian Horse Industry Council 2003, Outdoor Recreation Centre 2004). To date several have been drafted, some examples follow.

One was the outcome of an Australian Board of Inquiry into the death of a young Australian at a riding school in Queensland. The Board of Inquiry recommended 'that the Government introduce a self-contained set of standards pertaining to horse riding activities which has provisions covering self-employed persons, employers, employees (including voluntary workers), students/clients and visitors'.(Queensland Industrial Relations Commission 2000, 3). They suggested that new standards should include: a limited number of mandatory provisions which include risk assessments which identify risks and show how they can be eliminated; a requirement for all riders to wear standard approved helmets; instructors and guides to be qualified; clients to be supervised at all times. They also requested that guidelines should cover: safety equipment, minimum standards for tack; minimum age for instructors and other supervisors; minimum ratio of instructors to students; and

adequate levels of horse care, and that the standards should be widely advertised when introduced.

The AHIC have also drafted a Code of Practice for the Horse Industry. The standards have been written to address both improvement in the operations of the horse industry (best practice) and the personal safety of riders, staff, participants and spectators. The code divided the industry into four basic sectors – horse hire (trails, trekking and pony rides), coaching (riding schools, private lessons), events (dressage, cutting, shows), and agistment and provides guidelines within each discipline (AIHC 2004).

BHS Riding has introduced a system of riding school approvals. To qualify for BHS approval establishments must meet high standards of instruction, safety and horse care. The BHS support the accredited schools and keep them up to date with new legislation lobbying for a fair deal with government on their behalf. There were over 700 establishments accredited by 2004 in countries such as the the UK, Ireland, Belgium, Hong Kong, Spain, Italy, Crete, Dubai, Malaysia and the USA

5.6.4 Injury surveillance

The importance of nationally collected and detailed injury data has been stressed by most researchers. National injury surveillance databases enable researchers to specifically establish and study areas for prevention and provide profiles of affected groups (Brooks 1993, Press 1995, Young 1996; Farmsafe Australia 1999, Waller 2000, Cripps 2000a, Bixby-Hammett 2000a, Exadaktylos 2002, Bixby-Hammett 2003, Yurgil 2004, Baker 2004, Petridou 2004, Zavitsanos et al

2004). In New Zealand researchers had to plough through NZHISMDS free text data to locate information that could be used to examine equestrian accident description with outcomes.

The EU National Consumer Agency has recognised the important of leisure and recreational activities to the economy and elected to concentrate on the collection of data from this area in a bid to identify and analyse risks and injuries. Using the European Home and Leisure Accident Surveillance System data they were able to extrapolate the total number of annual injuries, but found that the data does not allow the distinction of cases where riding or horse handling occurred (Zavitsanos et al 2004).

It was suggested that the development of an e-code classification for horse-induced injuries was needed as currently none exist for horses. They are combined with other a 'large' farm animals (National Children's Centre for Rural and Agricultural Health and Safety 2001). When Langley (1996) examined farm related injuries he suggested that there should also to be classification which described place of occurrence, and the activity for work related events and he suggested 11 codes which could be used.

It was also recommended that ED staff could be recording and report more details of equestrian injury events such as whether patients were wearing helmets, the use of safety clothing, and other details such as injury location, and alcohol use (Ghosh 2000, Otoupalik 2003-4, Petridou 2004).

Individual parts of the equine industry such as racing should develop a national database of racing injuries so all injuries can be analysed annually (Press 1995, Waller 2000, Turner

2002). If this was done it will help identify if there are tracks that have a high number of injuries, or significant injuries, then further analysis can be done to put modifications in place (Press 1995).

A jockey database would also allow regular analysis to be made of the effectiveness of intervention strategies (McLean 2004). A study was being undertaken in Australia between 2004-2005, which was an extension of a web-based racing injury reporting system designed for horse injuries. It has been extended to include jockeys. The objective of the project was to manage information relating to human injuries and incident during race meetings. (RIRDC 2004).

A national database analysis would allow fall events during sports to be described and characterised and the risk of injury determined statistically (Cripps 2002). The monitoring of falls and the injuries sustained was by analysing data reports from the riders, technical delegates (first aiders) and jump judges (Cripp 2002). Cripps suggests that the data collected needs to be of a significant number of injury events to be used to apply valid statistical analysis although he found the structured narratives from riders interesting it was difficult to evaluate their usefulness within a prevention program (Cripps 2004).

5.6.5 Health & Safety

The Australian Centre for Agricultural Health and Safety and the National Occupational Health and Safety Database are proof that the analysis of data can be utilised to channel interventions in the correct area. WorkCover NSW Managing Farm safety course provides skills and health promotion

packages to farmers to farmers (Franklin 2002) Working with farmers and community

Occupational Health and Safety Acts required farmers to provide safe workplaces for its employers so it was suggested that careful policy design was needed here rather than rash responses as poor implementation of policy in the past has destroyed creditability for farm owners. Farm families are most often injured so policy needs to address their needs (Kelsey 1994).

6. Bibliography

"Current trends associated with horseback riding - USA 1987 - 1988." (1990). MMWR (Morbidity and Mortality Weekly Report) 39(20): 329-332.

"Horseback-riding-associated traumatic brain injuries - Oklahoma." (1996). MMWR (Morbidity and Mortality Weekly Report) 45.

Handling hooves. Safely picking out feet the right way. (1996)
Practical horseman. URL:
http://www.equisearch.com/safety/hooves_ph.html

"Study takes rare look at jockey injuries." (1999). IPRC News. The University of North Carolina Injury Prevention Research Center 10(2): 1,6.

Christen O'Donnell Equestrian Helmet Safety Act 2004. (2004)
URL: <http://www.theorator.com/bills108/s2254.html>

Abu-Zidan FM and Rao S (2003). "Factors affecting the severity of horse-related injuries." Injury 34(12): 897-900.

Accident Compensation Corporation (2002). Farm safety. Around the farm. ACC Thinksafe/ WorkSafe. [Wellington], Accident Compensation Corporation.

Accident Compensation Corporation (2005) Health & safety starter pack for the equine industry. [Wellington, NZ] : ACC : Dept. of Labour.

Accident Compensation Corporation (2005) ACC injury statistics 2004 (Third Ed). Section 20. Sports Claims. URL
<http://www.acc.co.nz/>

Accident Compensation Corporation (2003). New Zealand Injury Prevention Strategy. 2004/5 Implementation Plan. Wellington, ACC.

Accident Compensation Corporation (2004) Preventing recreational horse injuries. URL <http://www.acc.co.nz/>

Allen, S. (2003) The Horse Racing Industry & Workers' Compensation Task Force Report. URL:
<http://www.hbpa.org/resources/WCompTaskForceReport1.pdf>.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

American Academy of Pediatrics. Committee on Sports Medicine and Fitness (1992). "Horseback riding and head injuries (RE9245)." Pediatrics 89(3): 512.

Anthony-Tolbert S (2002). "Profiling equestrians injured in 'at home' riding accidents. Part I." AMEA News XIII(2): 1-5.

Anthony-Tolbert S (2002). "Profiling equestrians injured in 'at home' riding accidents. Part II." AMEA News XIII(3): 1-5.

Anthony-Tolbert S (2002/3). "Profing equestrians injured in 'at home' riding accidents." American Medical Equestrian Association. Safe Riders Foundation XIV(4): 5-7.

Australian Harness Racing Council (2004) Protective vests
www.harness.org.au/ahrc/VESTS.HTM

Australian Horse Industry Council (2003). Code of Practice for horse industry. Geelong, Victoria, Australian Horse Industry Council: 27p.

Australian Horse Riding Centre (2001) Checklist for approval for riding establishments. URL: <http://www.horseriding.org.au>

Baker R (2002). "United States Pony Club 2002 Accident Report." AMEA News XVI(1): 1-7.

Baker R (2002/3). "United States Pony Club Accident Report 2001." American Medical Equestrian Association. Safe Riders Foundation xiv(4): 8-11.

Baker SP and et al (1974). "Injury Severity Score: a method for describing patients with multiple injuries and evaluating emergency care." J Trauma 14: 187-196. URL:
<http://www.orthoteers.co.uk/Nrujip~ij331m/Orthtraumaiss>

Barone GW (1989). "Pediatric equestrian injuries: a 14 year review." Journal of Trauma-Injury Infection & Critical Care 29(2): 245-247.

Bath & North East Somerset. (2005) Strategy for horse riding – equestrian access on pedestrian/cycle paths. URL:
<http://www.bathnes.gov.uk>

Beatie BR, Teegerstrom T, et al. (2001). A partial economic impact analysis of Arizona's horse industry. Project completion

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

report. Phase I: Pleasure horse and racing impact update. Phase II: Horse show show impact. Tuscon, Department of Agricultural and Resource Economics. College of Agriculture and Life Sciences. The university of Arizona: 37p.

Bentley T, Page S, et al. (2001). "How safe is adventure tourism in New Zealand? An exploratory analysis." *Applied Ergonomics* 32(4): 327-338.

Bentley T, Page SJ, et al. (2000). "Safety in New Zealand's adventure tourism industry: the client accident experience of adventure tourism operators." *Journal of Travel Medicine* 7(5): 239-245.

Bernhang AM and Winslett G (1983). "Equestrian injuries." *The Physician and Sportsmedicine* 11(1): 90-19.

Berens C (2005) Horse-trading over insurance: why insurers and the equestrian industry must work together
http://www.legal500.com/devs/uk/is/ukis_104.htm.

Bixby-Hammett D (1987). "Accidents in equestrian sports." *American Family Physician* 36(3): 209-214.

Bixby-Hammett D (1992). "Pediatric equestrian injuries." *Pediatrics* 89(6 pt 2): 1173-1176.

Bixby-Hammett D (1998). "NEISS horse related injuries. Preliminary figures for 1997." *AMEA News* IX(3.): 6p.

Bixby-Hammett D (2000). "Horse related deaths in North Carolina 1978-1999. Medical examiner reports." *Caution: Horses* 5(4). URL: <http://utopia.utexas.edu/explore/equine/articles/deaths.htm>

Bixby-Hammett D (2001). "Medical implications. Masters of Foxhounds Association Covertside Survey, March 2000." *American Medical Association News* 7(1): 8-10.

Bixby-Hammett D (2001). "National Electronic Injury Surveillance system: Horse related injuries 2000." *American Medical Equestrian Association* 7(4): 7-9.

Bixby-Hammett D (2001). "National injury Data reveals details about accidents." *Caution: Horse* 6(1).

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Bixby-Hammett D (2002). "Animal related deaths." American Medical Equestrian Association (AMEA) News 8 (2): 6-9.

Bixby-Hammett D (2003). "Dangers in horseback riding vs hockey." American Medical Equestrian Association. Safe Riders Foundation XV(2): 9-11.

Bixby-Hammett D and Brooks WH (1990). "Common injuries in horseback riding: a review." Sports Medicine 9(1): 36-47.

Bixby-Hammett D, Brooks WH, et al. ([1993]) Horse related injuries. URL: <http://www.sportsci.org/encyc/drafts/Horse.doc>

Bond GR, Christoph RA, et al. (1995). "Pediatric equestrian injuries: Assessing the impact of helmet use." Pediatrics 95(4): 487-489.

BRC Marketing & Social Research (2004). Recreational horse riders: safety equipment and practice (draft). Wellington, BRC Marketing & Social Research: 31p.

British Horse Industry Confederation (2005) Consultation draft - Strategy for the horse industry in England and Wales. URL: <http://www.defra.gov.uk/corporate/consult/horse-strategy/consultation-horsestrat.pdf>

British Horse Society ([2004]) Horse sense for motorists. Think! Have some horse sense on the road. URL: <http://www.thinkroadsafety.gov.uk/campaigns/horsesense/pdf/a2.pdf>

British Horse Society ([2005]) Safety. Accident prevention and horse and rider safety. URL : <http://www.bhs.org.uk/>

Brooks WH (2000). Neurological athletic head and spine injuries. Cantu RC. Philadelphia, WB Saunders.

Brooks WH and Bixby-Hammett D (1988). "Prevention of neurological injuries in equestrian sports." The Physician and Sportsmedicine 16(11): 84-95.

Brooks WH and Bixby-Hammett D (1998). Sports Neurology. Jordon BD. Philadelphia, Lippincott-Raven: 381-391.

Brooks WW (1993). "AMEA protective vest survey." American Medical Equestrian Association (AMEA) News 3 (3).

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Broshek DK (2001). "Concussion diagnosis and management."
AMEA News 7 (4): 1-3.

Broshek DK et al. (2004). Equestrian sports (Section 3) in
Traumatic brain injury in sport: A neuropsychological and
international perspective, edited by Mark R Lovell. London:
Psychology Press.

Buckley SM, Chalmers DJ, et al. (1993). " Injuries due to falls from
horses." Australian Journal of Public Health 17 (3): 269-271.

California Thoroughbred Trainers (2004) CHSA Rolls Out a Safety
Program. URL: [http://www.thoroughbredinfo.com/showcase/ctt-
specialreports.htm](http://www.thoroughbredinfo.com/showcase/ctt-specialreports.htm)

Canadian Hospitals Injury Reporting and Prevention program
(CHRPP) (1995) Injuries associated with equestrian activities.
URL: www.hc-sc.gc.ca/hpb/lcdc/brch/injury/irreu_e.html

Carr L (2001). "United States Pony Club Accident Report 2000."
AMEA News 7 (3): 1-6.

Chitnavis JP, Gibbons CL, et al. (1996). "Accidents with horses:
what has changed in 20 years?" American Family Physician 27(2):
103-105.

Christey GL, Nelson DE, et al. (1994). "Horseback riding injuries
amongst children and young adults." The Journal of Family Practice
39(2): 148-152.

Cirelli A, Cloud B, et al. (2000) Horse related injuries in Nevada.
Fact sheet: 00-23. URL:
<http://www.unce.unr.edu/publications/FS00/FS0023.pdf>

Cohen L and Swift S (1999). "The spectrum of prevention:
Developing a comprehensive approach to injury prevention." Injury
Prevention 5: 203-207.

Comerford P (2002/3). "Putting the rubber to the road:
Incorporating safety information into youth horse programs."
American Medical Equestrian Association. Safe Riders Foundation
XIV(4): 12-13.

Condie C, Rivara FP, et al. (1993). "Strategies of a successful
campaign to promote the use of equestrian helmets." Public Health
Reports 108(1): 121-126.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Connor G (2002). "Prompt care for brain injury results in better outcomes." American Medical Equestrian Association. Safe Riders Foundation XIV(3): 7.

Costas-Paz M, Aponte-Tinao L, et al. (1999). "Injuries to polo players : a prospective evaluation." British Journal of Sports Medicine 33: 329-332.

Craig A, Tremblay-McGaw R, et al. (1998). "Injury prevention in the information age: the Injury and Violence Prevention Library." Injury Prevention 4: 150-154.

Cripps RA (2000). "Horse-related injury in Australia." Australian Injury Prevention Bulletin(24): 1-20.

Cripps RA ([2002]). EFA cross country falls questionnaire. A collaborative project between the Equestrian Federation of Australia and the Research Centre for Injury Studies, Flinders University. [Bedford Park, NSW], Flinders University: 7p.

Cripps RA and O'Brien D (2004). Monitoring falls during eventing. Establishment of a national surveillance system to monitor injury to riders and horses from falls during the cross-country phase of eventing in Australia. A report for the Rural Industries Research and Development Corporation. Barton, NSW, Rural Industries Research and Development Corporation: 72p. URL: <http://www.efanational.com/site/equestrian/national/downloads/content/attachments/riskmagt/FallsStudyReport310504.pdf>

Cripps RA, Pagano H, et al. (2002). Monitoring falls during eventing. Horse and rider injuries during the cross-country phase. A report to the Rural Industries Research and Development Corporation. Bedford Park, NSW, Flinders University: 37p. URL: <http://www.rirdc.gov.au/reports/HOR/02-082.pdf>

Cryer C, Langley J, et al. (2004). Developing valid injury outcome indicators: a report for the New Zealand Injury Prevention Strategy. Dunedin, Injury Prevention Research Unit, University of Otago.

Dawson J (202/3). "What stands between a child and an accident." American Medical Equestrian Association. Safe Riders Foundation XIV(4): 14.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Dawson J (2003). "Selecting a safe riding instructor. Part I." American Medical Equestrian Association. Safe Riders Foundation XV(1): 1,3-4.

Dawson J (2003). "Selecting a safe riding instructor. Part II." American Medical Equestrian Association. Safe Riders Foundation XV(2): 5-6.

Dawson J (2003/4). "Part III. Choosing a riding facility." American Medical Equestrian Association. Safe Riders Foundation XV(3): 9-11.

Dawson RO (2004) Horse accidents with injuries: January through March 2004. URL:
http://tarlton.law.utexas.edu/dawson/articles/041_accidents.htm

Dawson RO (2004). Horse accidents with injuries: April through June 2004. URL:
http://tarlton.law.utexas.edu/dawson/articles/042_accidents.htm

Day L, Asbhy K, et al. (1997). "Unintentional farm injury." Hazard (33): 1-13.

Dekker E, van der Sluis CK, et al. (2004). "Long-term outcome of equestrian injuries in children." Disability & Rehabilitation 26(2): 91-6.

Dekker R, Van Der Sluis CK, et al. (2003). "Long-term outcome of sports injuries: results after inpatient treatment." Clinical Rehabilitation 17: 480-487.

Department of Labour (2004). Measuring the cost of injury in New Zealand. Wellington, Department of Labour.

Dimich-Ward HM, Guernsey JR, et al. (2004). "Gender differences in the occurrence of farm related injuries." Occupational and Environmental Medicine 61: 52-56.

Driscoll T, Henley G, et al. (2003). The National Coroners Information System as an information tool for injury surveillance. Canberra, Australian Government. Australian Institute of Health and Welfare.

Equestrian Federation of Australia Risk management guide. URL:
http://www.efanational.com/content/risk_management/risk_management.htm

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Equine Education Institute (2001) Safety around horses (Some thoughts on horse safety while on the ground) URL:

<http://www.equus.com/safety.htm>

Equine Industry Training Organisation Inc (NZ) (2005)

Qualifications. URL: <http://www.equineito.co.nz/quals.html>

Exadaktylos AK, Eggli S, et al. (2002). "Hoof kick injuries in unmounted equestrians. Improving accident analysis and prevention by introducing an accident and emergency based relational database." *Emergency Medicine Journal* 19(6): 573-575.

Farmsafe Australia Inc (1999). Child safety on farms: a framework for a national strategy in Australia. Moree, NSW, Farmsafe Australia. URL:

<http://www.acahs.med.usyd.edu.au/nfidc/National%20Strategy%20for%20Child%20Safety%20on%20Farms.pdf>

Farmsafe NSW (2001). Future farmers: A rural health and safety resource for high school students. Moree, NSW, Farmsafe NSW.

URL:

http://www.acahs.med.usyd.edu.au/Future_Farmers/Future_Farmers.zip

Finch C and W. G (1997) Locking the stable door: preventing equestrian injuries. Summary . URL:

www.general.monash.edu.au/muarc/rptsum/es103.htm

Finch C and Watt G (1996). Locking the stable door: preventing equestrian injuries. Clayton, Victoria, Monash University Accident Research centre: 69p. URL:

www.monash.edu.au/muarc/reports/muarc103.html

Fleming PRI, Crompton JL, et al. (2001). "Neuro-ophthalmological sequelae of horse-related accidents." *Clinical & Experimental Ophthalmology* 29(4): 208-212.

Frankel HL, Haskell R, et al. (1998). "Recidivism in equestrian trauma." *American Surgery* 64(2): 151-154.

Franklin R and Crosby J (2002). "Farm-related injury in NSW: Information for prevention." *NSW Public Health Bulletin* 13(5): 99-102.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Franklin R and Fragar L (2002). The health and Safety of Western Australian farmers, farm families and farm workers. Kingston ACT, Australia, Rural Industries Research and Development Corporation. URL: <http://www.acahs.med.usyd.edu.au/nfidc/WA%20Profile.pdf>

Garrand J (2004). Health science literature review made easy. The matrix method. Boston, Jones and Bartlett.

Ghosh A, Scala CD, et al. (2000). "Horse-related injuries in pediatric patients." *Journal of Pediatric surgery* 35(12): 1766-1770.

Gibson T (1998). Australian Racing Board requirements for riders' protective vests. Sydney, Human Impact Engineering.

Gierup J, Larsson M, et al. (1976). "Incidence and nature of horse-riding injuries." *Acta Chirurgica Scandinavia* 142: 57-61.

Goldberg B, Harris SS, et al. (1992). "Horseback riding and head injuries." *Pediatrics* 89(3): 512.

Goulden RP (1975). "The medical hazards of horse-riding." *The Practitioner* 215: 197-200.

Grandin T (1999). "Safe handling of large animals (cattle and horses)." *Occupational Medicine* 14(2): 195-212.

Gray L (1999). "Adjust stirrups...safely." *Practical Horseman* 27(8): 16.

Green B (2002/2003). "UVM equine students pilot equestrian first aid and safety program." *American Medical Equestrian Association. Safe Riders Foundation XIV* (4): 15.

Greene EA and Trott JF (2004). "The self-guided horse facility analysis: a proactive safety education tool for equine facilities." *Journal of Extension* 42(6) URL: <http://www.joe.org/joe/2004december/tt5.shtml>

Griffen M, Boulanger BR, et al. (2002). "Injury during contact with horses: recent experience with 75 patients at a level I trauma center." *Southern Medical Journal* 95(4): 441-445.

Grossman J, Kulund D, et al. (1978). "Equestrian injuries: results of a prospective study." *JAMA* 240(17): 1881-1882.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Hamilton M and Tranmer B (1993). "Nervous system injuries in horseback riding accidents." *The Journal of Trauma* 34(2): 227-232.

Hammett D (1990). "Injuries associated with horseback riding: United States, 1987&1988." *MMWR (Morbidity and Mortality Weekly Report)* 39(20): 329-332.

Hendrikcks KJ and Adekoya N (2001). "Non-fatal animal related injuries to youth occurring on farms in the United States, 1998." *Injury Prevention* 7: 307-311.

Hobbs G, Yealy D, et al. (1994). "Equestrian injuries: a five year review." *Journal of Emergency Medicine* 12(2): 143-145.

Hockey R and Miles E (2001). "Horse-related injury." *Queensland Injury Surveillance Unit. Injury Bulletin*(67): 1-4.

Hockey RL, Horth A, et al. (1999). Farm-related injuries presenting at hospital emergency departments in Queensland. Rural99 Conference. URL:
<http://www.whs.qld.gov.au/conference/rural99/rural9923.pdf>

Holland AJA, Roy GT, et al. (2001). "Horse-related injuries in children." *Medical Journal of Australia* 175(11-12): 609-612.

Iba K, Wada T, et al. (2001). "Horse-related injuries in a thoroughbred stabling area in Japan". *Archives of Orthopaedic and Trauma Surgery* 121: 501-504.

Ingemarson H, Grevsten S, et al. (1989). "Lethal horse-riding injuries." *The Journal of Trauma* 29(1): 25-30.

Jenkinson DM and Jenkinson SW (2001). *Sports injuries: mechanisms, prevention and treatment.* Fu FH and Stone DA. Baltimore, Williams & Wilkins.

Joerger RM, Ferguson J, et al. (2000). "A comparison of stakeholder choices of farm safety training topics for Utah youth." *Journal of Agricultural Education* 41(4): 96-102.

Johns E, Farrant G, et al. (2003). "Animal-related injury in an urban New Zealand population." *Injury, International Journal of Care Injured* ??? 35: 1234-1238.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Kelsey TW (1994). "The agrarian myth and policy responses to farm safety." *American Journal of Public Health* 84(7): 1171-1177.

Kidsafe (1999) Get facts.... horse back riding safety. URL :
<http://www.capitalhealth.ca/NR/rdonlyres/eandk57zzmxbc5lfrfqomj2ahvfhnkkiw2kz3ixy2pefrdvepgfgh4yyklyvokf6zemxxwnjm6uwzp/Horse%252bRiding%252bSafety.pdf>

KiwiCareers (2004) Equine. URL:
http://www.kiwicareers.gov.nz/industry/il_agr/ilc_equ.htm

Koepke GH (2000). "Horse-related deaths in Ohio, 1980-1998 and plans to make road safer." *AMEA News XI* (4p).

Kriss TC and Kriss VM (1997). "Equine-related neurosurgical trauma: a prospective series of 30 patients." *The Journal of Trauma: Injury, Infection, and Critical Care* 43(1): 97-99.

Lamb C. (2000) "Equestrian helmet use in the national 4-H programs." *AMEA News XI*: 9-11.

Lamm W ([2001]) Staying 'a kick away'. A serious problem. KBR equestrian safety series. URL:
<http://www.whmentors.org/saf/kick.html>

Langley J (2004). "Challenges for surveillance for injury prevention." *Injury Control and Safety Promotion* 11(13): 3-8.

Langley J and Brenner R (2004). "What is an injury?" *Injury Prevention* 10(2): 69-71.

Larsen SL and Rock ND (1996). "The epidemiology of sports injuries in school-aged children." *Scandinavian Journal of Medicine & Science in Sports* 6: 281-286.

Liestman L (1998). "How about riding lessons?" *AMEA News IX*(3): 2p.

Lievens Y and Vriend I (2001). "Developing and implementing equestrian safety guidelines for Dutch riding schools." *Injury Control and Safety Promotion* 8(4): 273-276.

Lim J, Puttaswamy V, et al. (2003). "Pattern of equestrian injuries presenting at a Sydney teaching hospital." *ANZ Journal of Surgery* 73(8): 567 -571.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Lloyd Parry J (1993). The soft tissues. Trauma and sports injuries. McLatchie GR and Lennox CME. Butterworth Heinemann: 467-474.

Lowe R (2003). "Frangible. Is it a real word?" American Medical Equestrian Association. Safe Riders Foundation XV(2): 7-8.

Lowe R (2003). "Guidelines for medical coverage at equestrian events." American Medical Equestrian Association. Safe Riders Foundation XV(2): 3-4.

Lowe R (2003). "USEA Safety Committee Report." American Medical Equestrian Association. Safe Riders Foundation XV(3): 3.

Lower T and Wolfenden K (1995). "Preventing horse related child injury - a pilot education program." Health Promotion Journal of Australia 5(1): 46-50.

Maklewska E, Tarnowski W, et al. (2004). "New measuring stand for estimating a material's ability to damp the energy of impact strokes." Fibres & Textiles in Eastern Europe 12(3 (47): 48-52.

Malavase D (2001) Safe horses, safe riders. [A collection of articles on helmet use and certification of helmets. URL: www.nyshc.org/safe_horses_safe_riders.html

Malinowski K (1999). The economic impact of the horse industry in New Jersey and the United States. Fact sheet. FS517, The State University of New Jersey. Rutgers Cooperative Extension. URL: <http://www.rcrc.rutgers.edu/pubs/publication.asp?pid=FS517>

Mansmann L, Walker M, et al. (2003). "Attitudes towards equestrian safety among North Carolinians. Results of the North Carolina Horse Council Rider 2001 Safety Survey." American Medical Equestrian Association. Safe Riders Foundation XV(2): 7-8.

Marshall SW, Clarke J, et al. (1996). "Overview of injury on New Zealand farms." Journal of Agricultural Safety and Health 2(4): 175-190.

Masters RG (1991). "Equestrian injuries: a review." Clinical Journal of Sport Medicine 1: 123-126.

McAbee GN and C. PF (1996). "Intracranial hematoma in experienced teenage equestrians." Pediatric Neurology 15(3): 235-236.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

McKenzie, B (NZTR) (nztr_inspector2@clear.net.nz) 2006.
Literature Review . 31 March. Email to William Atkinson
(William.Atkinson@acc.co.nz)

McLean Professor J (2004). Assessment of protective jockey vests.
A report for the Rural Industries Research and Development
Corporation. Barton, ACT, Rural Industries Research and
Development Corporation: 15p. URL: <http://www.ridc.gov.au>

Middleton SB, Foley SJ, et al. (1995). "Partial excision of the
clavicle for nonunion in national hunt jockeys." *Journal of Bone
Joint Surgery* 77(B): 778-780.

Mills NJ and Whitlock MD (1989). "Performance of horse-riding
helmets in frontal and side impacts." *Injury* 20: 189-192.

Ministry of Agriculture and Forestry. Animal Welfare Advisory
Committee (1993). Code of recommendations and minimum
standards for the welfare of horses. Code of Animal welfare no.7.
Chapter 8. Horse Hire. Wellington, Ministry of Agriculture and
Forestry.: 47p.

Moss PS, Wan A, et al. (2002). "A changing pattern of injuries to
horse riders." *The Emergency Medicine Journal* 19(5): 412-414.

Mulhall KJ, Khan Y, et al. (2002). " Diastasis of the pubic symphysis
peculiar to horse riders: Modern aspects of pelvic pommel injuries."
British Journal of Sports Medicine 36(1): 74-75.

National Children's Centre for Rural and Agricultural Health and
Safety (2000) Equestrian Injury Prevention Strategies. What child
safety advocates can do. Fact sheet URL:
[http://research.marshfieldclinic.org/children/Resources/Equestrian/
Strategies.htm](http://research.marshfieldclinic.org/children/Resources/Equestrian/Strategies.htm)

Nelson DE and B.-H. D (1992). "Equestrian injuries in children and
young adults." *American Journal of Diseases in Children* 146(5):
611-614.

New Zealand Equestrian Federation (2003) Health and Safety
handbook . URL:
[http://www.nzequestrian.org.nz/upload/pdf/Resources/NZEF/22-
1-03%20NZEF%20H&S%20Handbook.pdf](http://www.nzequestrian.org.nz/upload/pdf/Resources/NZEF/22-1-03%20NZEF%20H&S%20Handbook.pdf)

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

- Nice T (2001). "Helmet safety Test. Performed by Wayne State Bioengineering lab. 1998 United States Polo Association Safety Committee." *AMEA News* XII(1): 1-3.
- Nicholl JP (1990). "Safety in horseriding." *British Medical Journal* 301: 496.
- Nilsen P (2004). "What makes community based injury prevention work? In search of evidence of effectiveness." *Injury Prevention* 10: 268-274.
- Niskanen R, Lindahl J, et al. (1994). "Is horse riding a dangerous recreation for young girls? A study at emergency departments of Lahti City hospital and Pajjat-Hame central hospital, Lahti." *Annales Chirurgiae et Gynaecologiae* 83: 225-228.
- Northey G (2003). "Equestrian injuries in New Zealand: knowledge and experience." *NZ Med J* 116(1182): U601. URL: <http://www.nzma.org.nz/journal/116-1182/601/>
- Norwood S, McAuley C, et al. (2000). "Mechanisms and patterns of injuries related to large animals." *Journal of Trauma* 48(4): 740-744.
- NSW.Thoroughbred Racing Board (Racing NSW) (2003). Occupational Health and Safety and injury management manual, NSW.Thoroughbred Racing Board (Racing NSW).
- Nunnunk L and Abu-Zidan F (2003). "Accidental carotid artery injury caused by a horse rope." *British Journal of Sports Medicine* 37(5): 460-461.
- O'Day J (2001). "Editorial: Horseriding a dangerous sport." *Clinical and Experimental Ophthalmology* 29: 207.
- O'Farrell DA, Irshad F, et al. (1997). "Major pelvic injuries in equestrian sports." *British Journal of Sports Medicine* 31: 249-251.
- Ontario. Statutes and Regulations (2001) Horse Riding Safety Act 2001. URL : http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/01h04_e.htm
- Otoupalik SS (2003/4). "Horse related injuries and deaths in Western Montana." American Medical Equestrian Association. Safe Riders Foundation American Medical Equestrian Association. Safe Riders Foundation(3): 4-8. URL: <http://www.ameaonline.org/>

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Outdoor Recreation Centre Inc (2004). Horse Trail Riding Adventure Activity Standards (AAS). For commercial owners and operators, volunteer organisations and employees, guides and trip leaders (commercial and non-commercial). Victoria, Outdoor Recreation Centre Inc: 19p. URL:
http://www.treadlightlyaustralia.com.au/projects/recreation/horseriding/resources/3rd_Draft_HorseTrailRiding.pdf

Paix BR (1999). "Rider injury rates and emergency medical services at equestrian events." British Journal of Sports Medicine 33(1): 46-48.

Pedigo J Tack safety. Regular safety checks of tack and horse can prevent accidents before they happen . URL:
<http://equisearch.com/tack/tacksafety081097/>

Pennsylvania State University. Equine Science (2004) 4-Horse Safety Resources. URL: <http://www.das.psu.edu>

Petridou E, Kedikoglou S, et al. (2004). "The mosaic of equestrian-related injuries in Greece." Journal of Trauma 56(3): 643-647.

Phillip Gray and Associates (2000). South Australia. Recreation and sport horse strategy. Vol 1. Final report prepared for the Office of Recreation and Sport, Phillip Gray and Associates. URL:
http://www.recsport.sa.gov.au/research-planning/state_rec_sport_horse.pdf

Pointer S, Harrison J, et al. (2003). National injury prevention plan priorities for 2004 and beyond. Discussion paper. Canberra, Australian Institute of Health and Welfare.

Pony Club UK (2004) Standards of efficiency test sheet. Riding and Road Safety Certificate. URL:
http://www.pcuk.org/output/tests/page_1548.html

Pounder DJ (1984). ""The grave yawns for the horseman" Equestrian deaths in South Australia 1973-1983." The Medical Journal of Australia 141: 632-635.

Practical Horseman (1996) Handling hooves: safely picking out feet the right way. URL:
www.equisearch.com/safety/hooves_ph.html

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Press JM, Davis PD, et al. (1995). "The National Jockey Study: an analysis of injuries to professional horse-racing jockeys." *Clinical Journal of Sports Medicine* 5(4): 236-240.

Probert L ([2001]) Nature vs nurture: Beyond 'helmets are uncomfortable'. URL: www.mcshc.org/helmet_facts.htm

Probert LL (1999) Self-reported equestrian behaviour regarding protective headgear. West Virginia University 1226.

Queensland Government. Department of Employment, Training and Industrial Relations (2002) Horse riding schools, trail riding establishments and horse hiring establishments industry code of practice. URL: www.qld.gov.au/icp/icp012.pdf

Queensland Government. Workplace Health and Safety (2003). "Safety in riding horse. Safety link rural." *Rural*(13): 1-2.

Queensland Industrial Relations Commission (2000) Report of the Board of Inquiry established by the Queensland Government to consider certain matters relating to riding schools. URL: <http://www.qirc.qld.gov.au/>

Quinn S and Bird S (1996). "Influence of saddle type upon the incidence of lower back pain in equestrian riders." *British Journal of Sports Medicine* 30: 140-144.

Racing NSW ([2005]) Occupational Health and Safety. WorkCover 'Train the Trainer' Project. URL: <http://www.racingsnw.com.au/page.asp?parm=ohs.trainthetrainer>

Redcar and Cleveland Borough Council (2005) Draft Equestrian Strategy. URL: http://www.redcar-cleveland.gov.uk/pdf/equestrian_strategy.pdf

Regan PJ, Roberts JO, et al. (1991). "Hand injuries from leading horses." *Injury* 22(2): 124-126.

RMIT University (2001) Australian company and RMIT researchers develop new technology to make horseriding a safer sport. URL: <http://www.rmit.edu.au/browse/News%20and%20Events%2FNews%2Fby%20date%2F2001%2FOct%2FWed%2031/>

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

RMIT University (2003) Equestrian stirrup research wins international prize. URL:

<http://www.rmit.edu.au/browse/News%20and%20Events%2FNews%2Fby%20date%2F2003%2FJan%2FWed%2029/>

Roe JP, Taylor TKF, et al. (2003). "Spinal and spinal cord injuries in horse riding: the New South Wales Experience 1976-1996." ANZ Journal of Surgery 73: 331-334.

Rogers MS ([2004]) Horse riding during pregnancy. URL:

http://www.obgyn.net/displayarticle.asp?page=/pb/articles/horse_riding

Rural Industries Research and Development Corporation (RIRDC) (2004) Development of web-based racing industry human reporting system. URL:

<http://www.usyd.edu.au/su/rirdc/projects/study13.html>

Sapien R (2000) Pediatric horse-related injuries in New Mexico.

URL:

<http://tarlton.law.utexas.edu/dawson/amea/jun00nws.htm#pediatric>

Sherlock, S (2002) "Risk management." Hoofbeats April/May: 34-35

Silver JR (1973). "Spinal injuries in sports in the UK." British Journal of Sports Medicine 27(2): 115-120.

Silver JR (2002). "Spinal injuries resulting from horse riding accidents." Spinal Cord 40(6): 264-271.

Simpson DG and Jackson AG (1999) Equine risk management a suitable approach to horse handling. Presented at the Farm Injury Prevention Conference 1999.

Sommers CM (1999) An analysis of horse-related injuries recorded in Rural Utah Hospital Emergency Department records. Logan, Utah. Utah State University 70p. URL:

http://wwwlib.umi.com.ezproxy.auckland.ac.nz/dissertations/previous_all/1392937

Sorli JM (1998). "Equestrian injuries: a survey in British Columbia, Canada." AMEA News IX(2): 3p.

Sorli JM (1998). "Equestrian mortality: A comparison of 1975-1990 and 1991 in Alberta Canada." AMEA News IX(3): 2p.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Sorli JM (2000). "Equestrian injuries: a five year review of hospital admissions in British Columbia, Canada." *Injury Prevention* 6(1): 59-61.

Sport and Recreation New Zealand (SPARC). ([2002]). SPARC Facts – equestrian Sports. URL
<http://www.sparc.org.nz/research/pdfs/equestrian.pdf>.

Sport and Recreation New Zealand (SPARC). (2003). SPARC Facts Results of the New Zealand Sport and Recreation Surveys (1997-2001) URL:
http://www.sparc.org.nz/research/pdfs/SPARC_Facts_wholedoc.pdf
(Accessed 18.6.03)

Sport & Recreation Victoria (1996). Preventing equestrian injuries. Facts on horse-related injuries. Fact sheet, Sport & Recreation Victoria: 2p. URL:
<http://www.monash.edu.au/muarc/projects/horse.pdf>

Swinkler AM (2004). 4-H Horse Project. Member's manual, Reprinted and revised by University of New Hampshire Cooperative Extension: 105-116. URL:
<http://equineextension.colostate.edu/documents/MA1500.pdf>

Temes RT, White JH, et al. (1997). "Head, face and neck trauma from large animal injury in New Mexico." *Journal of Trauma* 43(3):492-5.

Tevis C (1997). "Unsafe riding habits put youth at risk." *Successful Farming* 97(5): 59.

The Association for Horsemanship Safety and Education in Australia Inc. (2004). Standards for group riding programs. Strathalbyn, SA, The Association for Horsemanship Safety and Education: 11p. URL:
<http://www.ahse.info/documents/STANDARDS%202004%20current%202005.doc>

The Equestrian Federation of Australia (2003) Risk management/ Rider Safety URL:
http://www.efanational.com/content/risk_management/safety.htm

The Pony Club (2004) Riding and Road Safety. Standards of efficiency test sheet 2004. Riding and Road Safety Certificate URL:
www.pcuk.org/output/tsts/page_1548.html

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Thompson JM and von Hollen B (1996). "Causes of horse-related injuries in a rural western community." *Canadian Family Physician* 42: 1103-1109.

Thoroughbred Net Online (2004) ACC Rates for 2005-6. URL
<http://www.thoroughbrednet.co.nz/nztrainers/News.asp>

Turner M, McCrory P, et al. (2002). "Injuries in professional horse racing in Great Britain and the Republic of Ireland during 1992-2000." *British Journal of Sports Medicine* 36(6): 403-409.

Ueek BA, Dierks EJ, et al. (2004). "Patterns of maxillofacial injuries related to interaction with horses." *Journal of Oral Maxillofacial Surgery* 62(6): 693-696.

UK. Department for Transport (2004) Road safety good practice guide. URL:
http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/pdf/dft_rdsafety_pdf_504564.pdf

UK. Department for Transport (2004) Tomorrow's roads - safer for everyone: The first three year review. URL:
http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/pdf/dft_rdsafety_pdf_028165.pdf

van Nieuwenhoven AL, van Laarhoven CJ, et al. (1997). "Pelvic injuries in equestrians on buck-jumping horses [Case reports]." *The Journal of Trauma* 43(5): 867-868.

Waller AE, JL Daniels et al. (2000). "Jockey injuries in the United States." *JAMA* 283(10): 1326-1328.

Waninger KN (2004). "Management of the helmeted athlete with suspected cervical spine injury." *The American Journal of Sports Medicine* 32(5): 1331-1350.

Washington State University. Corporative Extension ([2003])
Horses are fun. 4-H member manual. The 4-H horseless Horse Project. EM4715 . URL:
<http://cru.cahe.wsu.edu/CEPublications/em4715/em4715.pdf>

Watt GM and Finch CF (1996). "Preventing equestrian injuries: locking the stable door." *Sports Med* 22(3): 187-197.

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature

Webster J and Mariger SC (1996). Horse safety "It's just good sense". Utah, Utah State University Extension. URL:
<http://extension.usu.edu/files/agpubs/ahs01.pdf>

Whitlock MR (1993). "Body protectors." AMEA News III(3): 1p.

Whitlock MR (1999). "Injuries to riders in the cross country phase of eventing: the importance of protective equipment." British Journal of Sports Medicine 33(3): 212-216.

Whitlock MR, Whitlock J, et al. (1987). "Equestrian injuries: a comparison of professional and amateur injuries in Berkshire." British Journal of Sports Medicine 21(1): 25-26.

Williams F and Ashby K (1995). "Horse related injuries." Hazard(23): 1-13.

Wolfenden K, McKenzie A, et al. (1992). "Identifying hazards and risk opportunity in child injury." Australian Journal of Public Health 16(2): 122-128.

Young NB, Stueland DT, et al. (1996) Surveillance of riding and non-riding equestrian injuries at a rural medical centre. Poster. No. 4S. URL:
www.marshfieldclinic.org/nfmc/projects/initiatv/horseby.html

Yurgil MG (2004). "An epidemiological look at head injuries in young, female horseback riders." AMEA News XVI(1): 12-13.

Zavitsanos X, Petridou E, et al. (2004). An initiative for the collection of data regarding injuries in the consumer services sector. Prepared for the European Commission, DG SANCO. Athens, National and Kapodistrian University of Athens: 316p. URL:
http://ec.europa.eu/health/ph_projects/2002/injury/fp_injury_2002_exs_03_en.pdf

Interpreting Human And Horse Interactions Equestrian Injuries In NZ
A review of the literature