



## Equestrian injuries in New Zealand, 1993–2001: knowledge and experience

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### Abstract

**Aims** The aims of this study were to investigate the extent of equestrian injuries in New Zealand and provide a range of prevention interventions.

**Methods** An examination of New Zealand Health Information Service (NZHIS) morbidity data for 1993 to 2001 and mortality data for 1993 to 1999 was undertaken. Recent studies on equestrian injuries were evaluated.

**Results** NZHIS data indicated that as a result of horse-related injuries 5613 people were hospitalised between 1993 and 2001 and there were 16 fatalities between 1993 and 1999. Horse-related injuries were most prevalent in young females aged 10 to 19 years. Among Maori (the indigenous people of New Zealand), men predominated in horse-related injury numbers. Overall, half of equestrian injuries occurred in those under the age of 19 years. The major injury site was the arm. High equestrian-injury rates were recorded in rural regions.

**Conclusions** The findings indicate that age and regionally specific practical injury prevention strategies, health promotion messages and educational programmes are required. In particular, clear rules and regulations on protective and safety clothing are likely to enhance safety. Education in horse behaviour is required to facilitate safer environments on and around horses. A code of practice for horse riding and trekking establishments could decrease the risk of injury to those who hire horses.

Sport and Recreation New Zealand's 2001 data 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,<sup>1</sup> and 9% for those aged 18 to 24.<sup>2</sup> 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.<sup>1</sup>

However, death and injury from horse-related activities in New Zealand have not been well documented, and consequently injury prevention opportunities have been limited.

Buckley and colleagues investigated injuries due to falls from horses for the period 1977–1986. Findings suggested that most horse-related injuries involved a fall that resulted in head injuries, thus indicating a need for helmet use and safe riding practices.<sup>3</sup> Furthermore, while young people were most likely to experience severe injuries, they were not over represented within participation rates. Buckley and colleagues concluded that the rate of hospitalisation due to falls from horses was comparable to the rate of injuries from playing rugby. Numbers of horse-riding claims to the Accident Compensation Corporation in 2001/2 were approximately one thirteenth of rugby claims. However, the long-term costs of horse-riding claims were

higher, with ongoing claims for horse-riding injuries averaging \$16 582 per claim, while rugby injuries averaged \$13 516 per claim.<sup>4</sup>

A recent examination of New Zealand recreational and adventure tourism injuries found that 'of the commercial adventure tourism activities, horse riding and cycling were the only significant contributors to overseas visitor injuries'.<sup>5</sup> It suggested that there was a need to focus industry attention on standards of safety for horse-riding participants by the introduction of regulatory codes of practice.

Informed by a desire to improve horse-related injury prevention opportunities, the aims of this research were to: (1) examine the extent of equestrian injuries in New Zealand; and (2) recommend a range of appropriate countermeasures based on current recommendations from published research.

## Methods

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. Records were selected using the ICD-9 (Ninth International Classification of Diseases) codes 827 'Animal-drawn carriage', 828 'Accident involving animal being ridden', and 829 'Other road vehicle accidents', where the injured person was the rider of the animal or occupant of an animal-drawn carriage. While these codes may include incidents involving animals other than horses, these records are assumed to be minimal.

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 8.1 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.

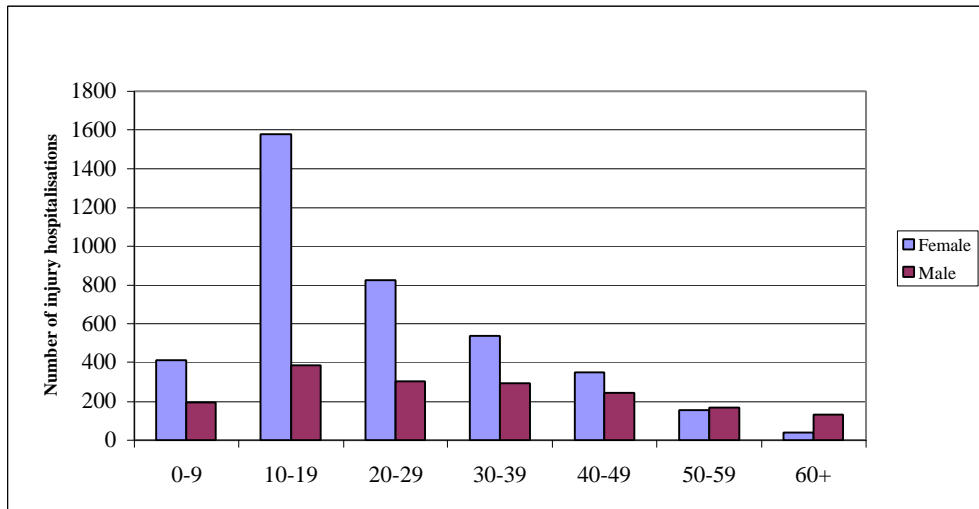
An evaluation of the findings of recent studies on equestrian injuries, both national and international, was also undertaken.

## Results

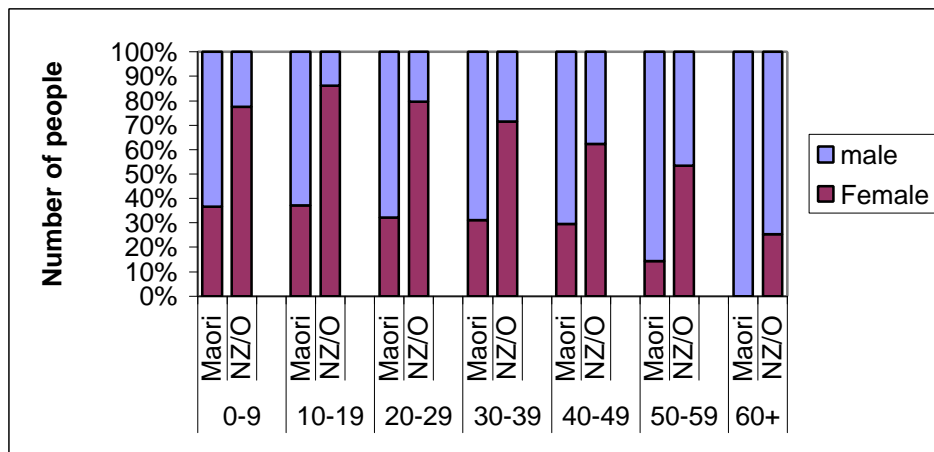
Analysis of NZHIS data for 1993–1999 found that 16 people died following horse-related injuries. For the period 1993–2001, 5613 people were hospitalised for horse-related injuries. Females accounted for 69% ( $n = 3893$ ) of injuries and 56% ( $n = 9$ ) of deaths. Those most at risk of horse-related injuries were young females between the ages of 10 and 19 years, who accounted for 35% of these injuries. Nearly half of the total injuries sustained (46%) were to those under 19 years of age. Those aged between 10 and 29 years received 55% of horse-related injuries. In those aged 50 years and above (9% 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 1).

An examination of the data 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 (88.6%) of those injured were NZ Pakeha/European/Other; 11% were Maori and 0.4% Pacific. Within Maori those most at risk were Maori males. Approximately two thirds (67%) of injuries to Maori were to males, compared with 26% to NZ Pakeha/European/Other males. Maori females accounted for 33% of injuries to Maori, while NZ Pakeha/European/Other females sustained 73% 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 (30%), East Coast (21%) and Northland (17%).

**Figure 1. Hospitalisation numbers for horse-related injuries by gender and age**



**Figure 2. Hospitalisation numbers for horse-related injuries by ethnicity, age and gender (NZ/O = New Zealand Pakeha/European/Other)**

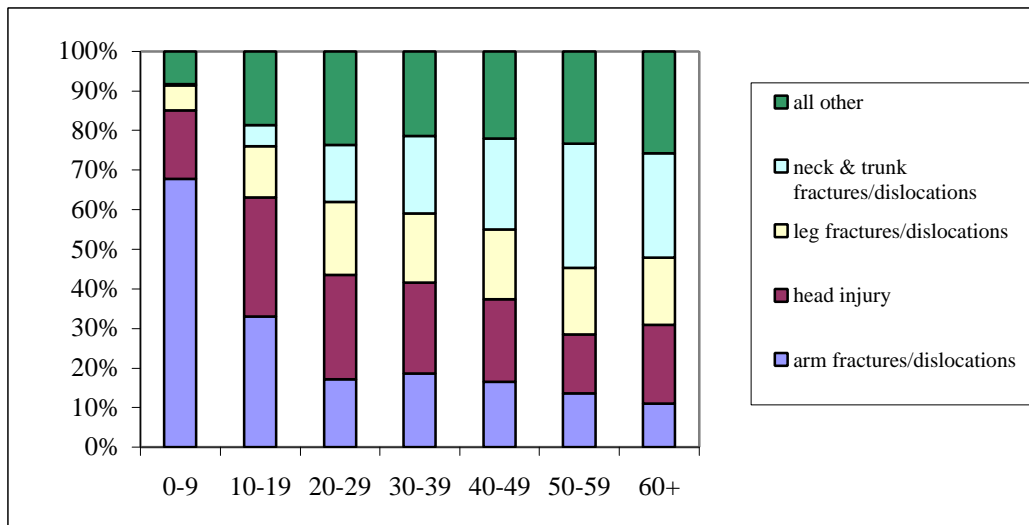


Data indicated that the major injury site was the arm (28%) (Figure 3). This included fractures and dislocations. Arm fractures and dislocations increased from 186 (26%) in 1993 to 206 (31%) in 2001. Head injuries accounted for 25% of injuries. However, the number of head injuries decreased from 175 (25%) in 1993 to 134 (20%) in 2001. Leg injuries accounted for 15% of injuries. Leg fractures and dislocations also decreased from 145 (20%) in 1993 to 100 (15%) in 2001.

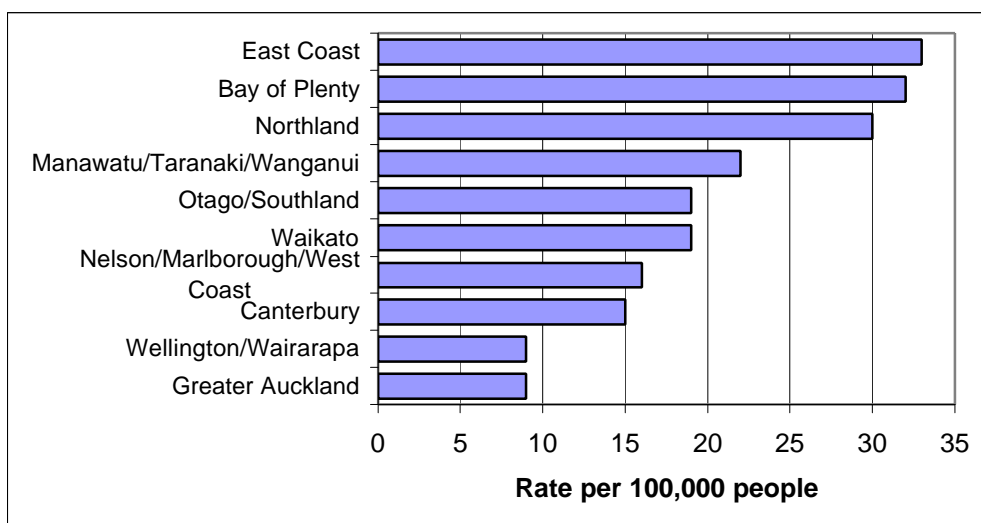
Between the ages of 0 and 9 years, 68% of injuries were to the arms. Between the ages of 10 and 19 years, head (30%) and arm injuries (33%) were almost equal in numbers. Head injuries and fractures/dislocations of the neck and trunk increased for those aged 30 years and over. Between 50 and 59 years, neck and trunk injuries were most common (31%).

A regional comparison of injury rates revealed that Greater Auckland sustained the highest number (600) of horse-related injuries. However, the region's injury rate was one of the lowest (10 per 100 000). The highest injury rate was recorded on the East Coast (32 per 100 000) followed closely by the Bay of Plenty (31 per 100 000), Northland (28 per 100 000) and Manawatu/Taranaki/Wanganui (21 per 100 000) regions. The lowest rates were in regions that have significant urbanisation, although Greater Auckland and Wellington/Wairarapa (8 per 100 000) include urban and rural areas (Figure 4).

**Figure 3. Hospitalisations for horse-related injuries by injury site**



**Figure 4. Hospitalisation rate for horse-related injuries by region**



Farms (15%) and places of recreation and sport (15%) were the most predominant locations at which injuries occurred. Injuries were also sustained on streets and

highways (3.5%) and at home (5%). The location of more than half of all horse-related injuries was unspecified (55%).

The majority of injuries (85%) were sustained while riding; 25% 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.

## **Discussion**

This research has identified that young females aged 10–19 years sustain the highest number of horse-related injuries and fatalities. An investigation of health-harming behaviours amongst New Zealand youth found that many young people engage in high levels of risk-taking behaviours such as not wearing a helmet in recreational activities.<sup>6</sup>

To find causation in relation to the findings for ethnicity a variety of issues would need to be explored such as the significant number of Maori living in rural areas where riding behaviour may differ extensively from general sport and recreational use of horses. A comparison of horse numbers and injury numbers on a regional basis provided little insight into causation.

Research into participation time and the purpose for riding may identify areas at which interventions could be targeted. Where riders are involved in work-related activities helmet wearing and protective measures might be better advocated as an occupational health and safety issue.

A large number of injuries were the result of a fall from the horse. A recent Australian study also found that 77% of injuries were the result of falls in urban and rural areas.<sup>7</sup> A pictorial examination of falls from horses showed why a significant number of injuries were sustained either to the head (27%) and arms (28%), as most riders who fall from a horse are projected head forwards and downwards.<sup>3</sup> Roe and colleagues<sup>8</sup> state that when seated on a horse the rider's head can be up to 4 m above the ground and evidence indicates that a fall from as little as 60 cm can cause permanent brain damage.

A study by Chitnavis and colleagues, which compared injuries sustained in an earlier study in 1971 with those sustained during 1991, found a near fivefold ( $p < 0.001$ ) decrease in head injuries.<sup>9</sup> The authors suggest that significant decreases in serious head injuries can be mainly explained by the increased use of improved helmets. Further support comes from a recent study, which indicates a lower level of head trauma among those falling from a horse while wearing helmets.<sup>10</sup> This indicates the continued need to promote the wearing of standard approved safety helmets.

An increase in injuries to the upper limbs was found by Moss and colleagues, who suggested that while protective equipment has concentrated on the head and body to date, this should now be extended to the arms, particularly the wrists. The acceptability of wrist guards has been examined in other sports.<sup>11</sup> However, as wrist guards are likely to hamper the delicate wrist movements needed by the rider to direct the horse, other authors suggest that interventions should concentrate on the instruction of falling techniques.<sup>10</sup>

An Australian study examined the frequently reported locations for horse-riding injuries as fields/paddock (29%) and public roads (16%).<sup>7</sup> New Zealand data has shown that injuries sustained on the roads are much lower (3.5%). However, because of the high number of locations that were not specified (55%), this number could be much higher. Better practice in the collection and recording of data at hospitals and emergency departments could provide a fuller picture of the locations in which injuries occur. These locations could then be targeted for prevention strategies.

Past studies have suggested that up to one third of horse-related injuries are received while on the ground around horses.<sup>12</sup> A recent Queensland study has identified 16% of injuries to have happened when the patient was not mounted on the horse,<sup>13</sup> while the data analysed in this research indicated that in New Zealand 25% of injuries were sustained during non-riding activities. Education on horse behaviour for those spending time around horses, whether riding or working is important. A recent Australian investigation found that in all but 15 cases out of 1034 the horse receiving a 'fright' was the factor precipitating the injury event.<sup>7</sup> Unanticipated horse behaviour was a factor in 61% of the child cases (under 15 years old) and 39% of the adult cases (over 15 years old) reported in this research.

All activities around horses, whether while riding or on the ground, have their risks. Even a quiet horse can be 'spooked', starting a series of events that can lead to an injury.<sup>14</sup> The key to safety is in protection and awareness. The Hughston Sports Medicine Foundation suggests that an equestrian may have a serious injury once every 350 hours of riding.<sup>15</sup> However, others suggest that the rate of injury is considerably lower and may be as low as 0.06 per 1000 riding hours.<sup>16</sup> An evaluation of equestrian activities and the participation time of each rider is problematic as activities range from irregular sport and recreational use of horses to riding exclusively for work and transportation.

Unfamiliarity with horses and horse behaviour is also a major problem in the trekking environment.

Bentley and colleagues' study of injuries to overseas tourists in New Zealand suggested that horse riding should be seen as a high 'actual' risk activity and should have high standards of safety for participants.<sup>5</sup> They suggested a need for standards and regulatory codes, which address level of training, qualifications and experience required for guides, appropriate client-guide ratios, equipment specifications and the use of personal protective clothing.

Bentley and colleagues also suggested that the provision of footwear and clothing appropriate for the activity should be made mandatory in adventure tourism. In the case of horse riding this would include the provision of a standard approved helmet, which is fitted correctly, and the provision of boots or shoes with smooth soles.

Data from the United States indicate that over one third of horse-related injuries seen at emergency departments occurred during riding lessons.<sup>17</sup> To date no research has been done in New Zealand in this area but interventions such as a code of practice for riding establishments could have a significant impact on injury rates.

Queensland recently produced a code of practice for trekking and riding establishments, which examines enforcement and also explores ways to manage identifiable risk.<sup>14</sup> The Code covers instruction, environment and welfare, tack,

evaluation of level skills, horse behaviour, safety equipment, road safety, accidents and incidents. This document could be examined and adapted for New Zealand riding establishments for the safety of their clients. Horse riding can be an extremely rewarding and healthy sport as long as riders adhere to safety measures.

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