WA Childhood Injury Surveillance Bulletin

Research REPORT

Princess Margaret Hospital for Children, Emergency Department

Outcomes on the Implementation of Additional Codes for Sports Injuries




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Contents

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1. Introduction

Injury is a major health problem worldwide. Millions of deaths worldwide are attributed to injury each year, while many more cases require hospitalisation and external medical attention. The economic costs of injury are substantial. Treatment and rehabilitation costs represent a large proportion of many national health budgets. These costs are further confounded by the economic losses stemming from lost productivity. The implications of injury have long been realised. Since the inaugural World Conference on Injury Prevention and Control in Sweden in 1989, improving injury surveillance has been a priority for many organisations around the globe.

Injury surveillance involves the systematic collection of injury related data for a given population group. Injury Surveillance Systems (ISS) can be valuable tools as they can provide timely indications of epidemiological changes in injury occurrence. The knowledge gained can then be used to assist in the development of injury prevention initiatives.

The Western Australian Childhood Injury Surveillance System was established in 1986 by the Western Australian division of the Child Accident Prevention Foundation of Australia (now Kidsafe WA). This ISS collected a range of data from cases presenting to the Emergency Department of Western Australia's Princess Margaret Hospital for Children (PMH). Collected data included casualty demographics, factors preceding the injury, the nature and location of the injury and the outcome of attendance to hospital. The first full calendar year for which data was available was 1987, enabling the 1987 Annual Report to be written.

While the ISS of 1987 was a valuable tool in recording patient data and identifying trends, it had a number of limitations. As with any ISS, it was unable to capture all relevant cases of injury. Only a portion of injured children within Western Australia present to hospital Emergency Departments and only a proportion of these presentations are to the Princess Margaret Children's Hospital. Injury Surveillance Systems are limited to recording and showing trends for the most serious injuries warranting emergency medical attention. Data collection was inconsistent during early stages of ISS operation, making the preliminary data sets incomplete. They were limited to core data and failed to collect specific and precise details surrounding the nature of the injury.

Between 1987 and 2007 the ISS was subject to a number of modifications. The major impacts on the ISS were changes to the coding sets in 2004, which saw the coding sets reduced and the remaining sets simplified, reducing the ability to develop targeted injury prevention messages. However, several new codes were added during this time including: Triage codes to record the assessed level of injury severity at time of presentation; and codes to identify whether casualties were of aboriginal descent. In June 2006, a new set of sport-specific data codes were introduced to enable precise identification of sporting activities and expansion of the restricted data set introduced in 2004. Data codes were also added relating to the use of safety equipment at the time of injury (helmets, knee pads, mouthguards etc). These additions have enabled more detailed analysis of sporting injury to be made.

This report examines sports injury data collected by the PMH ISS for the twelve months between 1st July 2006 and 30th June 2007. Where possible, comparisons have been made with the 1987 Annual Report. Reliability of comparisons with the 1987 data is limited due to: the limitations of the data; changes to the sporting codes and minimal analysis of sports injuries in 1987.

This report highlights the 2006 additions to the coding system, the benefits and implications of these, and the on going limitations of the ISS that need to be addressed.

2. Demographic Data

PMH Emergency Department Presentations for Injury

During the study period July 2006 to June 2007 the Princess Margaret Hospital Emergency Department saw a total of 49,820 presentations. Of these presentations 11,990 (24%) were due to injury. 21.9% of these injuries (n=2,633) occurred while engaging in sporting activity. This represents 5.3% of all presentations to PMH ED within the study period.

The 2006-07 data encompasses all presentations to PMH ED regardless of casualty age. This differs from the analysed 1987 data which is confined to children aged 14 years and less. This is a significant difference in reporting that has developed over the last two decades. Current reports take into account the fact that adolescents up to the age of 16 continue to present to PMH ED, despite their concurrent utilisation of non-child specific hospitals. The inclusion of data on casualties over the age of 14 is of particular importance for injury causes such as sporting activities, where a substantial proportion of presentations are made by those over 14 years. The purpose of this report is to highlight the differences in sports injury coding between the time periods. Consequently, data on children over 14 years will be retained in the 2006-07 data set.

Children aged over 14 years accounted for 4.7% of injury presentations during 2006-07 and for 9.8% of sporting injury presentations. As a result, the noted differences between the study periods are more substantial than would be present if this additional group was removed.

There appears to be a 59% rise in injury presentations between 1987 and 2006-07. This apparent increase reduces to 51.5% when only considering the casualties aged up to 14 years. Analysis shows that the proportion of injuries attributable to sporting activities remained consistent over two decades, both when analysis includes and excludes casualties aged over 14. Of the 7,573 injury presentations in 1987, 19.8% were sustained during a sporting activity (n=1,501). Of the 11,424 comparable injury presentations in 2006-07, 2,374 were sporting injuries (20.7%).

The 1987 report did not record the total number of presentations to PMH that year, consequently sports injuries as a proportion of total presentations can not be compared.

Table 1: PMH Emergency Department Presentations

	Total presentations	Total injury presentations	Injury presentations <15 years	Total sporting injury presentations	Sporting injury presentations <15 years
1987	n/a	7,537	7,537	1,501	1,501
2006 to 2007	49,820	11,990	11,424	2,633	2,374

There are a number of differences between the activities included in the "sporting injuries" categories of 1987 and 2006-07. The "sporting injuries" category in the 1987 annual report does not include bicycle injuries, skateboard injuries or trampoline injuries but reports on each individually. In contrast, the 2006-07 data combines bicycle, skateboard and trampoline injuries with all other sports injuries. To enable comparisons between the two periods, data from the four separate categories reported on in 1987 have been combined within this report. Analysis of trampoline data is limited however and has not always been able to be included. In these cases the omittance has been noted.

Table 2: Composition of figures used from 1987

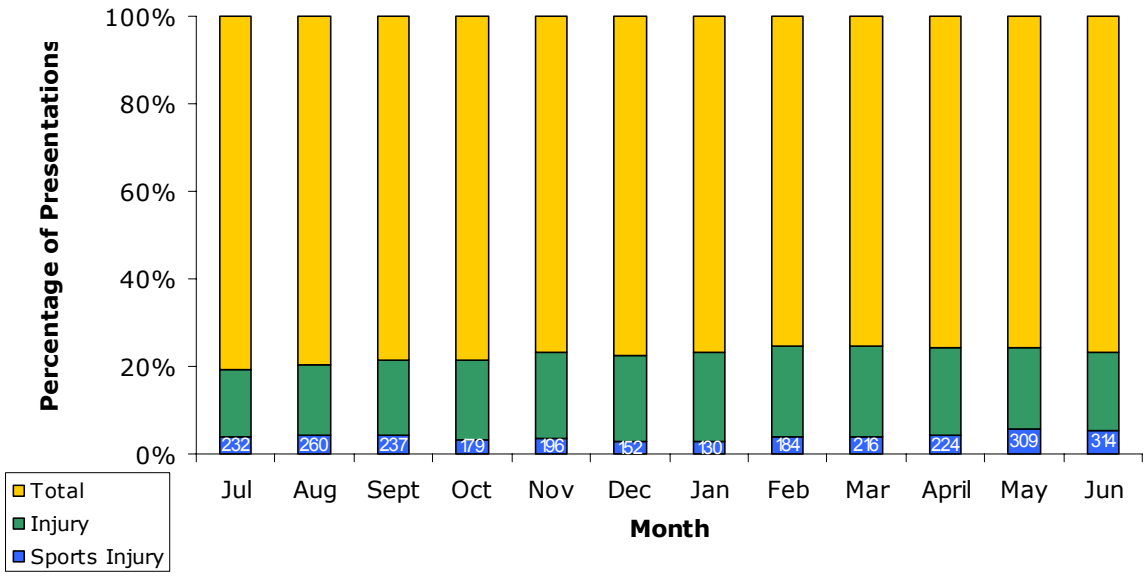
Activity	Presentations
Sport specific	647
Bicycle	606
Skateboard	153
Trampoline	95
TOTAL	1,501

Monthly Distribution of Sporting Activity Injuries

In 2006-07 the peak months for sports injury coincided with the beginning of the winter sports season (Figure 2). Sports injury presentations during the winter months accounted for 30.6% of sports injury presentations compared with 17.7% for the summer months. This effect may be due to the nature of winter sporting activities compared with those associated with the summer period, or may simply be an effect of this particular time frame.

The 1987 Injury Surveillance Report breaks down total child injuries by month, however it does not indicate the monthly distribution specific to sporting activity injury. Reliable comparison between 1987 data and current data for peak sport injury months is therefore not possible.

Figure 1: PMH Emergency Department presentations by month, 2006/07

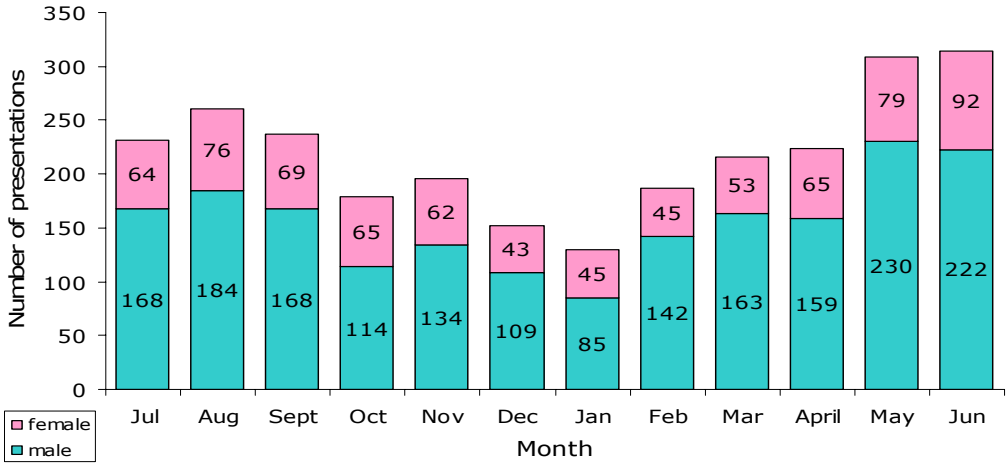


Gender Distribution of Sporting Activity Injuries

In the last twenty years the male to female ratio for PMH injury presentations has reduced from 3:2 to 2:1. In contrast, the gender ratio specific to sporting activity injuries has remained at 5:2 (data excludes trampoline injuries). Male children continue to be more likely than female children to present to the PMH Emergency Department for injuries sustained during sporting activities.

The monthly breakdown for 2006 to 2007 shows that the gender ratio of 5:2 remained fairly constant throughout the year (see Figure 2). Female presentations accounted for the highest proportion of sporting injuries in October (36.3%), while they accounted for the lowest proportion in February & March (both 24.5%). This could be due to the differing natures of seasonal sporting activities dominated by each gender. Alternatively, it may simply be a random occurrence of the particular time period. The 1987 report does not provide a monthly breakdown of sporting injuries with which to make comparisons.

Figure 2: Gender Distribution of Sport Activity Injuries by month, 2006/07



Age Distribution

Both the 1987 and 2006-07 data indicate that the proportion of sporting injuries increases with age. This trend has continued over the last twenty years, with injuries in the 10-14 years age group still representing the greatest proportion of sports injury presentations to PMH (See Figure 3). It must be noted that trampoline related injury is again not included in the 1987 analysis.

Comparison between the two sets of data is made difficult due to the exclusion of data on children over the age of 14 years in 1987 report. In 2006-07 this age group represented 10% of all sporting injury presentations. If this was also the case in 1987, then there are an estimated 150 unaccounted for cases of sporting injury. This must be kept in mind when comparisons are made.

Figure 3: Sporting Activity Injuries by Age

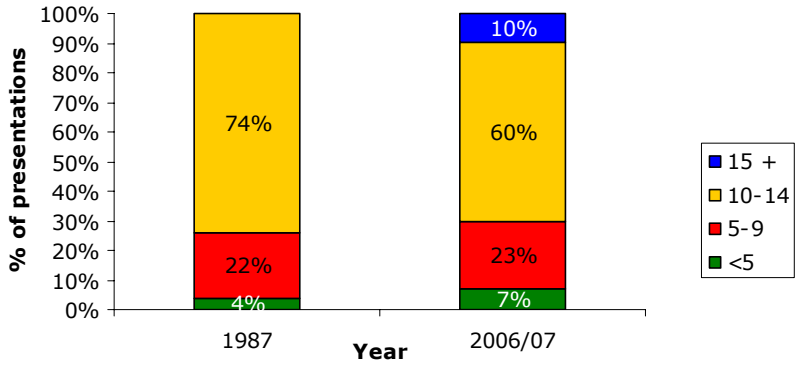
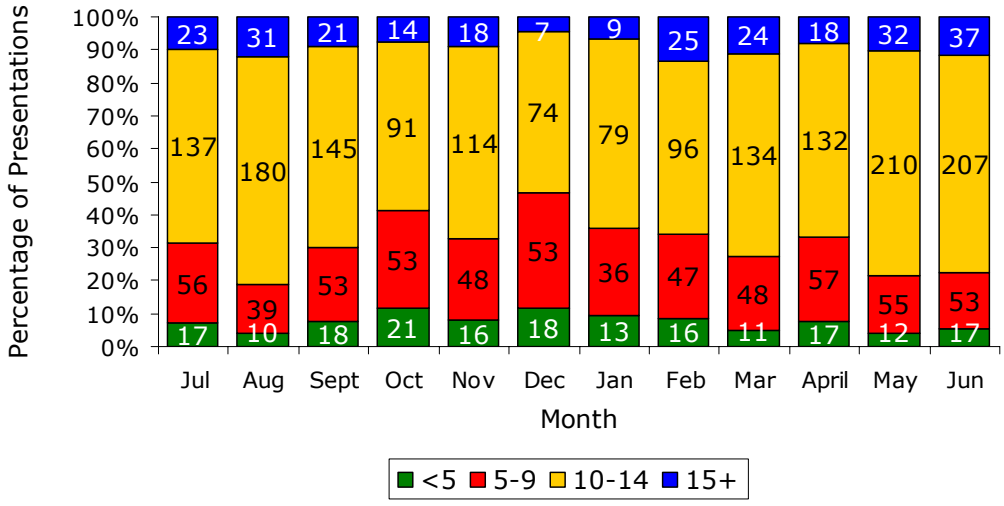


Figure 4 shows the age distribution of sporting activity injuries by month 1st July 2006 and 30th June 2007. The proportion of injuries represented by the <5 years and 5-9 years age group varies little throughout this time. The observed seasonal fluctuation is accounted for by the 10-14 years age group. This is possibly due to the greater number of children in this age group participating in organised sports, the nature of which alters throughout the year. There is no specific data available from 1987 with which to make comparisons.

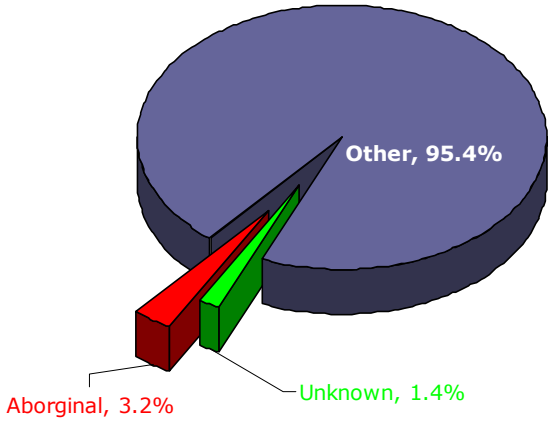
Figure 4: Age Distribution of Sport Activity Injuries by month, 2006/07



Aboriginality

A valuable addition to the 2006-07 ISS was the recording of Aboriginality. Children of Aboriginal or Torres Strait Islander (ATSI) descent represented 3.2% of Emergency Department presentations due to a sporting injury for 2006/07 (see Figure 5). This is comparable to the percentage of individuals of ATSI descent in Western Australia, which was 3.0% at the time of the 2006 Census. There were no significant gender or age grouping differences between Aboriginal and non-aboriginal children. Comparisons cannot be made with 1987 data as no details on Aboriginality were included in the 1987 data set.

Figure 5: Aboriginality of Sporting Activity Injuries, 2006/07

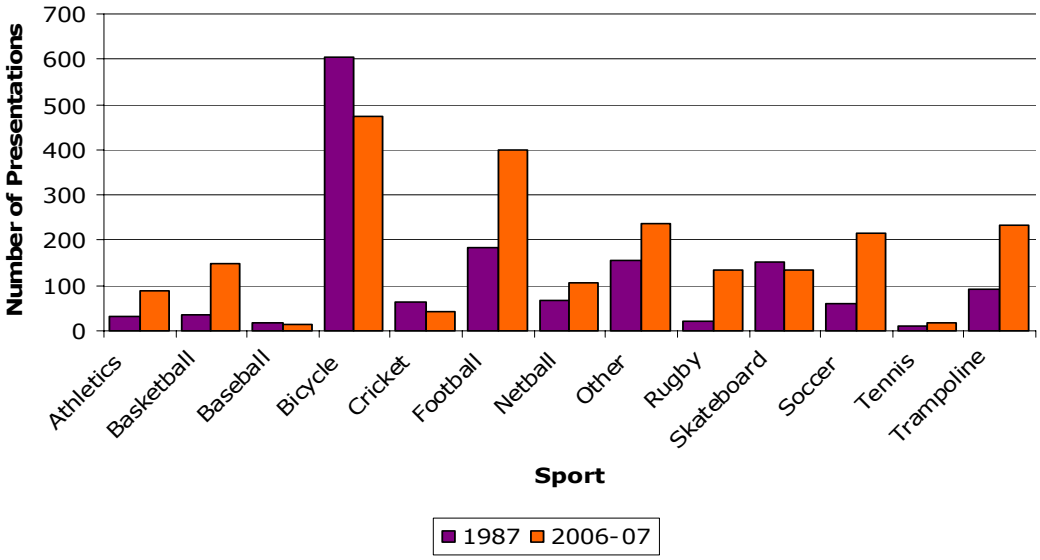


3. Injury Data

During both study periods, the sporting activities resulting in injury presentations were many and varied. Figure 6 shows the distribution of the main causes of sporting activity injuries for the 1987 and 2006-07 periods. Despite remaining the leading cause of sporting injury, bicycle related injuries have almost halved, falling from 40% to 21% over the twenty year period. The only other sporting activity to see a reduction in injury incidence was skateboarding, dropping from 10% to 6%. The introduction and strengthening of laws regarding bicycle helmets, altering public attitudes to safety precautions and improved infrastructure may be reasons behind the reductions in injuries from these activities. Football was the second highest cause of injury in both time periods, followed by trampoline and soccer related injuries.

It is unclear whether the sporting data from 1987 includes injuries from motorcycles, scooters and skating. These are included in the "Other" category in 2006-07, which may be why there are so many more presentations in this category compared to 1987.

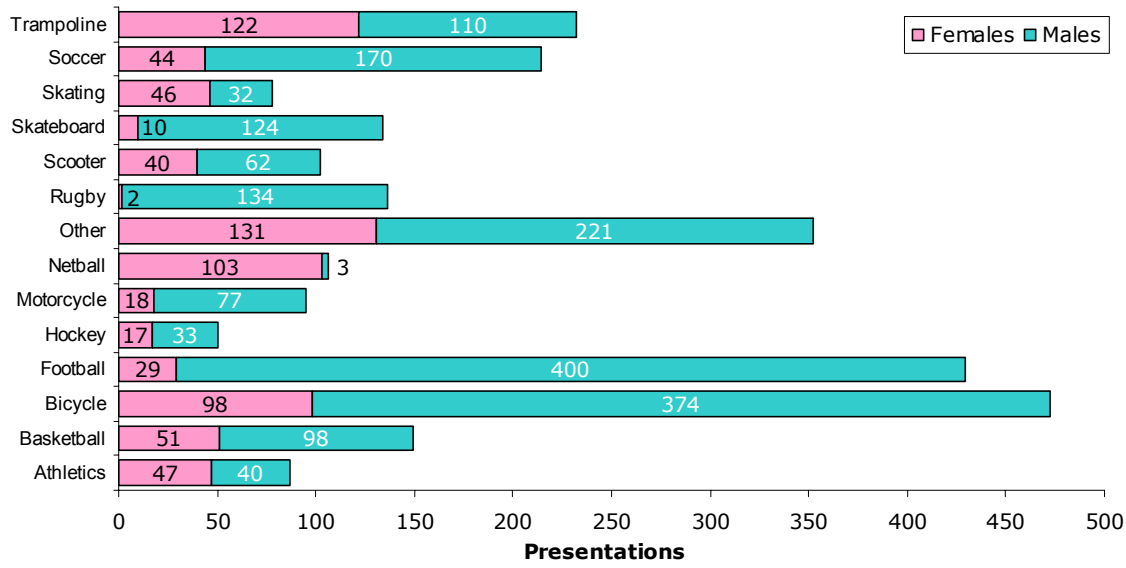
Figure 6: Main Cause of Sporting Activity Injuries



Sporting Activity by Gender

Figure 7 shows the breakdown of sporting activity by gender for 2006-2007. Males dominated presentations in the majority of sporting activities, particularly in the various football codes. Skating, trampoline and netball were the only sports that saw more females injured. Riding of a bicycle represented the highest number of presentations, though football had the greatest number of gender specific injuries. Although age and sporting activity data was collected using the 1987 ISS, the 1987 annual report does not provide a breakdown of sporting activity by gender. The lack of available data to make comparisons with is a limitation of the 1987 annual report, not of the ISS itself.

Figure 7: Sporting Activity by Gender, 2006/07



Location of Injury

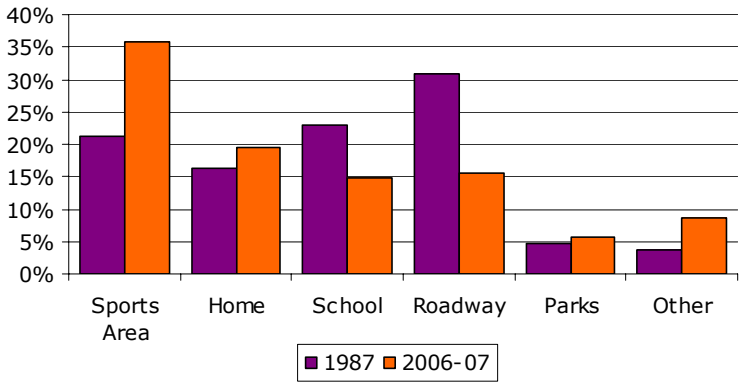
The location of sporting activity injury has undergone several changes between the 1987 and 2006-07 study periods. In 1987 the most common location for sporting activity injury was on roadways, accounting for 31% of all sporting activity injuries. By the 2006-2007 study period this figure had dropped to 16%.

It could be interpreted as being largely accounted for by the reduction in bicycle injuries occurring on roadways, however it could also be associated with changes in children's activities between 1987 & 2006/07 with many more children being involved in organised sports rather than playing with friends outside and on the roads. This is also supported by a 4% increase in home sporting injuries as we see a shift in children spending time outside in community areas into the home.

School sporting activity injuries dropped, falling from 23% to 15%. The opposite trend can be also seen in sports areas and parks, with increases of 15% and 1% respectively. This indicates the need to look at safety initiatives targeting designated sporting areas and organised sports.

The 1987 data does not include the figures for location of trampoline injury occurrence. It is possible that the proportion of sporting injury locations may change with the inclusion of this data.

Figure 8: Location of Sporting Activity Injury



4. Assessment and Treatment Data

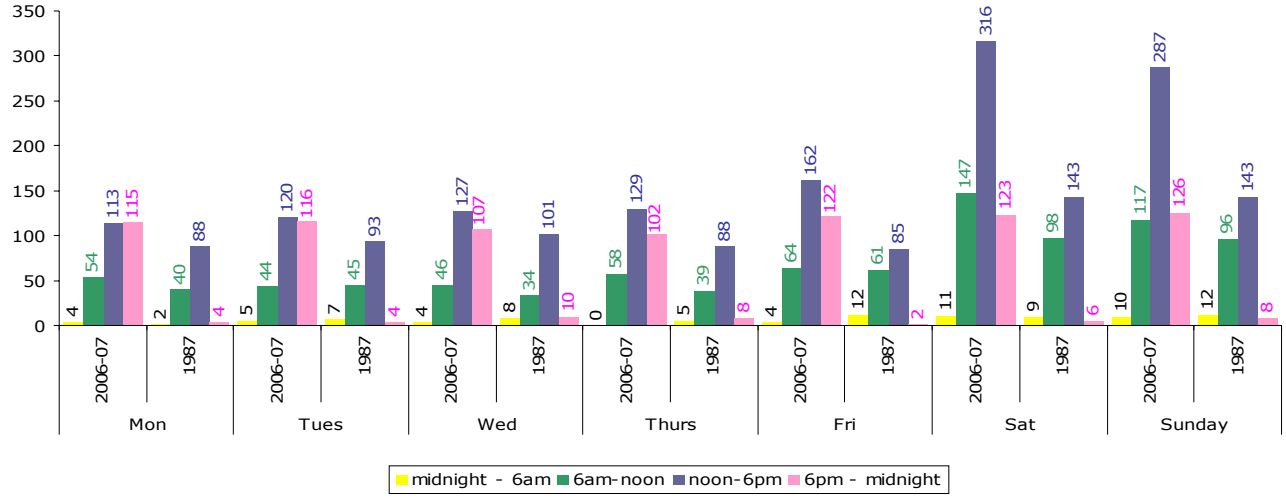
Day and Time of Sporting Activity Injury

Figure 9 shows the frequency of injury presentations for time and day of week during 1987 and 2006-07. The 1987 figures are incomplete however, as they exclude data on both trampoline and skateboard sporting injuries.

In both study periods the majority of sporting injuries occurred on the weekends, with most sporting injuries occurring between noon and 6pm on all days. This may be because these are time periods when children are often not in school and thus have the opportunity to engage more frequently in sporting activities. This explanation is supported by the increased rates of sporting injuries occurring between 6am and noon on weekends, as compared to the same time on weekdays.

The day and time of sporting activity injury has remained similar between 1987 and 2006-2007. This may alter however if the missing data for skateboard and trampoline injuries was available.

Figure 9: Day and Time of Sporting Activity Injury

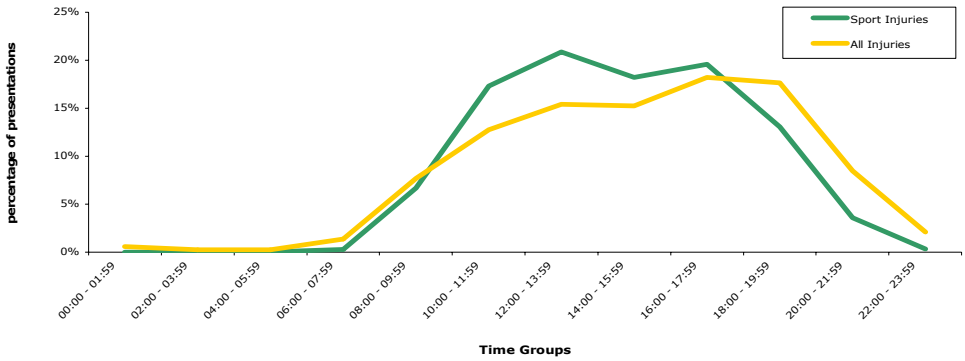


Injury

During the study period (2006/07) a trial of daylight saving was introduced in WA. The injury presentations after 6pm during the summer months was observed to be 3 times higher than the average for the remaining 9 months of the year.

As shown in Figure 10, the majority of children are injured during sporting activity during daylight hours. There are two peak injury periods during the day for sports injuries, one after midday and the second late in the day before sunset. Similarly, in 1987 there were also two peak times during the day in which injuries were most prevalent, however the peaks were shifted two hours earlier. In 1987, one peak sports injury time occurred at 10am (12.83% of sports injuries) and another peak at 12 noon (14.68% of sports injuries). The shift in peak injury time between 1987 and 2006-07 may be a reflection of changes in policy and practice for school physical education and sports in the intervening years.

Figure 10: Time of Sporting Activity Injury Presentations versus All Injury Presentations, 2006/07



Triage Category of Sporting Injury

As part of the 2006-07 ISS, triage codes were assigned to all casualties presenting to the PMH ED. These codes denote the assessed severity of injury upon presentation. Triage code 1 represents the most severe injuries, while triage code 4 represents those considered relatively minor.

The triage codes of 2006-07 show that most injuries sustained from sport activity are not severe. This should mitigate some of the general public's apprehension that sport participation exposes children to severe injuries. Four motorcycle, one equestrian, and one scootering injury were assigned Triage Code 1. Triage Code 2 and 3 accounted for 3% and 23.9% of total sport injuries respectively. Figure 11 shows the breakdown of Triage Code Frequency.

Figure 11: Distribution of Sport Injury Triage Codes, 2006/07

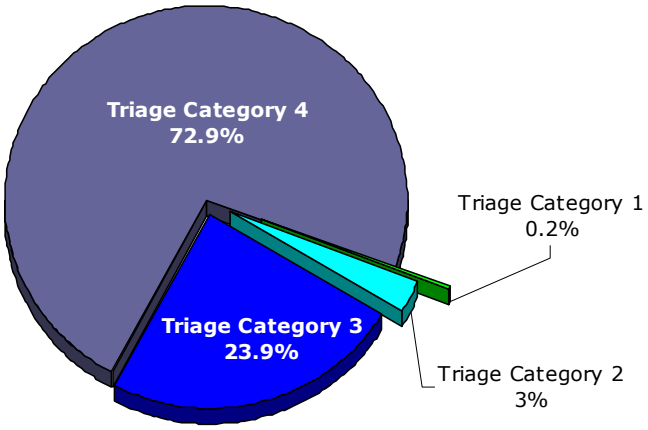
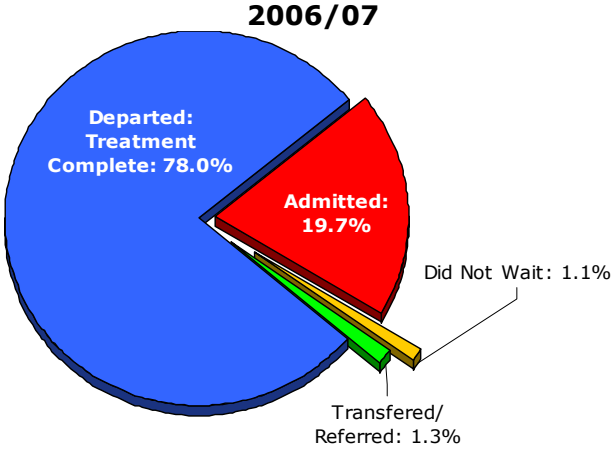


Figure 12: Outcome of Attendance, 2006/07

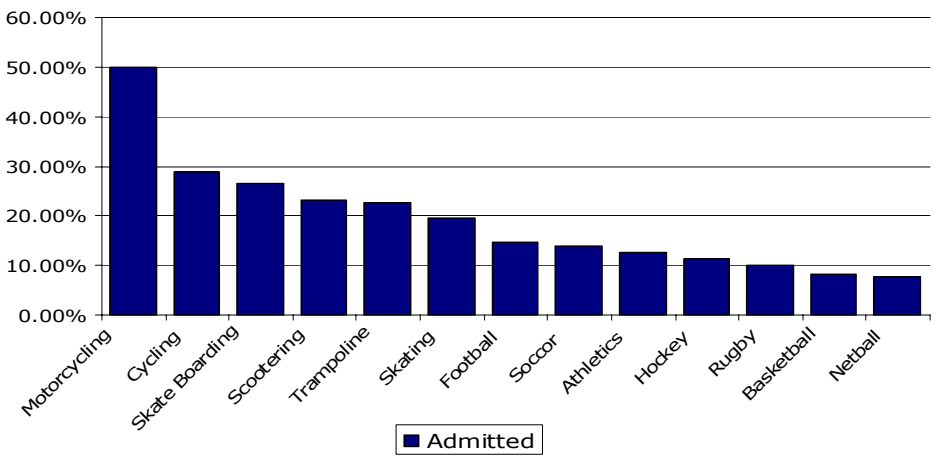


Treatment and Disposal of Casualties from Hospital

In the majority of cases children received treatment for their injuries within the Emergency Department. Figure 12 shows that 78% were discharged following treatment in the Emergency Department, 19.7% had injuries requiring admission to PMH and a further 1.3% were transferred to another hospital or referred to another department. Data in the 1987 report does not breakdown the treatment and disposal of casualties specific to sporting injuries. This is a limitation of the ISS of previous years, whereas current reports enable the outcomes of sporting injuries to be analysed.

Figure 13 shows the hospital admission rates for child injuries caused by different sporting activities between July 2006 and June 2007. There is significant variation in the percentage of admissions for the different sporting activities. The highest percentage of admissions occurs for injuries resulting from motorcycle and bicycle accidents. The data does not enable these figures to be linked to non usage of safety equipment, though this may be a contributing factor. The sports with the least admissions were netball and basketball. This is likely due to the less serious nature of injuries received.

Figure 13: PMH Admissions for Sport Activity, 2006/07



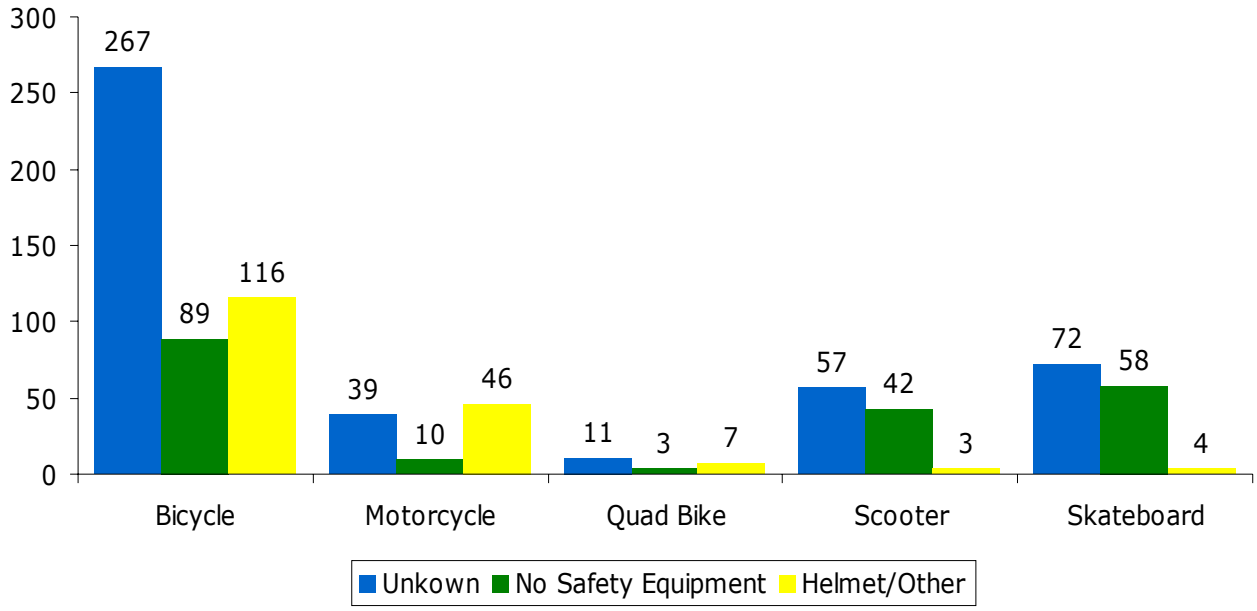
Usage of Safety Equipment

Participation in sporting activities coupled with usage of safety equipment where appropriate is promoted by Australian health authorities to improve the health of children. Whilst many sporting activities may be modified age-appropriately to reduce common injuries, the use of helmets and other safety equipment remain important methods of injury reduction.

Helmet usage was recorded in 21.4% of all 2006/07 presentations where helmet use was advocated for the sporting activity (see Figure 14). Sporting activities such skateboarding, roller-skating and scooters were the least likely to have helmet usage recorded. Usage of a helmet whilst riding a pedal cycle and motorcycle is currently a legal requirement, however less than 50% of children presenting to the Emergency Department were recorded as wearing one at the time of their injury. Children under 5 years old were the least likely to wear a helmet compared with older age groups.

Since provision of safety equipment during sport activity is a new addition as part of the new sport injury codes, only limited statistics are available on early data. Two sporting activities analysed in 1987 recorded the use of safety equipment. Alarmingly only 5% of bicycle injury presentations and 2% of skateboard injury presentations were using a helmet when the injury occurred. This left a staggering 94.5% of injury victims presenting not using any safety devices when the injury occurred. The 1987 data probably contributed to the introduction of legislation for helmet use for bicycle riding.

Figure 14: Usage of Safety Equipment, 2006/07



5. Discussion: A Comparative Approach

Changes in the Injury Surveillance System and the data coding set since 1987 have limited the possibility of detailed comparison between past and current data. The 1987 Annual Report did not undertake a detailed analysis of sporting injuries. While the ISS collected data on injury distribution by month, day and time, casualty gender and age, the annual report did not examine these in specific reference to sporting injuries. Therefore, many details pertaining to sporting injuries are not known and can not be compared to current data.

Detailed comparisons would not have been possible even with access to the raw 1987 data as the data collection was incomplete. This has impeded the ability to effectively monitor child injury - sporting injury in particular. Observation of true trends has not been possible, meaning that assessing the impact of associated factors has been difficult and the development of preventative measures hindered. The introduction of uniform data codes and sport-specific injury codes in June 2006 means that comprehensive data can be collected in a uniform manner, enabling interventions to be developed for specific child sport injuries.

In previous years, sport injuries were either only briefly analysed, or analysed as a whole with all childhood injuries. This generalised grouping method complicates the identification of injury problem spots, as sport injuries often differ in mechanism from non-sport injuries. Current data collection covers a far more extensive field of child injury details than previous years' data sets. The main four modifications are the addition of triage codes, aboriginality codes, sport activity codes and safety equipment codes.

The addition of sport injury Triage Codes offers the prospect of more comprehensive analysis of childhood injuries. With injuries able to be classified by severity, analysis can be done to pinpoint commonalities within these triage categories. Data analysis has the potential to establish joint relationships between triage code and different injury factors to explore whether one particular factor leads to a more severe triage code. It will also allow analysis to be done to see the relationship between triage codes and patient outcomes. This will further aid the development of effective injury prevention campaigns as more information on the cause of injury is now available. Campaigns can be devised to target the sporting activities and their associated factors that result in the most severe injuries with the poorest outcomes. In depth analysis of the given data has the potential to reveal areas where intervention may be of most value.

The provision of details on safety equipment relating to sports injuries will assist greatly in the development of injury prevention measures. It will enable the extent of safety device usage by children injured in sports to be determined and whether the use affected the severity of their injury. Sport injuries differ in mechanism from general injuries, meaning that different safety equipment is involved and different data must be collected. Injury-specific safety equipment data will enable researchers to observe the use of both personal safety equipment (eg. helmets, knee pads, mouth guards) and the environmental safety equipment such as goal post padding. Injury prevention campaigns targeting specific safety equipment problem areas can then be developed to promote or legislate the use of particular safety items.

There is a large health differential between Indigenous and non-Indigenous Australians. A multitude of cultural, linguistic and economic factors mean that interventions devised to improve their health need to be specifically tailored. The ISS Ethnicity codes introduced in 2006 enable the identification of Aboriginal casualties and the factors relating to their injury. This will provide insight into why Aboriginal child injury is at a higher level than for non-Aboriginal children and will enable appropriate preventative measures to be developed. For example, isolating the aboriginal data cases shows that 13.1% of Aboriginal children were not using a safety device at the time of injury, compared to 8.4% of non-Aboriginal children. Similarly, 4.8% of Aboriginals were recorded as wearing a helmet and 2.4% using other sport related guards, which is different from the corresponding figures of 7.2% and 2.7% for non-Aboriginals.

Factors pertaining to sporting injuries differ greatly between sporting activities. The new ISS coding system includes codes that identify a more comprehensive range of sporting activities. This will enable identification of injury risk factors for particular sporting activities. Campaigns can then be developed to target the sporting activities that result in the highest burden of child injuries and to address factors specific to different sports.

The mechanisms behind sports injuries differ greatly from the mechanisms of general injuries. Sports injuries warrant additional analysis to ensure that the causal factors are identified and taken into account. The 2006 additions to the Sports Injury Coding assist in this identification and will allow trends to be observed and evidence based interventions developed.

6. Future Investigations

A reliable system for collecting and compiling data regarding sport injury statistics is vital to the monitoring and development of strategies to prevent or minimise childhood injury. The implementation of additional sport injury codes are a valuable resource for monitoring child sports injuries and providing specific details on sport injury occurrences. This data can be used to evaluate the development of possible injury trends, thereby identifying injury problem spots. Equipped with this information, organizations such as Kidsafe WA now have the tools to initiate effective implementation of injury prevention campaigns. Data are not only harbingers for potential injury problems spots, but also act as feedback mechanisms when assessing the effectiveness of injury prevention campaigns.

In order to support a more detailed Injury Surveillance System, the support of doctors, triage nurses, and hospital staff is pivotal to ensuring the accuracy of collected information. Previous Injury Surveillance reports in 1987-1990 have cited incompleteness of data as a possible source of data skewing. As this report reveals, comparisons between previous years' and current statistics are limited due to inconsistencies and varied levels of data completion. The 1989 Injury Surveillance Report states that "Further examination of data for previous years indicated there were also major differences in the coding methods from one year to the next." This stresses the need for an efficient and reliable system of data collection, as unreliable data can make pinpointing injury problem areas difficult and issue misleading information as to the nature of child sport injuries.

Opportunities for further development were alluded to in the discussion section. The introduction of injury triage code classification presents the prospect of joint analysis of data, identifying relationships between triage code and other injury factors. This will aid in examining trends relating to injury severity i.e. use of safety devices vs. triage code, location of injury vs. triage code. Monitoring injuries by postcode may also be beneficial for monitoring trends in child injury prevalence. Beneficial additions to the data collected by the ISS include information on whether the sporting activity was competitive, organised or informal, and on the involvement of items of equipment such as ball, bat, racquet, goal post. For the purpose of developing interventions, it may also be worth recording whether casualties were ESL (English as a Second Language), or CALD (Culturally and Linguistically Diverse).

June 2006 saw the introduction of definitive data fields for safety equipment relating to a variety of sporting and recreational activities. This type of data further enhances the targeting of safety programs and opens doors to a more comprehensive analysis of child injury cases.

The WA Childhood Injury Surveillance Bulletins are developed by Kidsafe WA in consultation with the Princess Margaret Hospital Emergency Department Injury Surveillance Officer and funded by the WA Department of Health.

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