

THE UNIVERSITY OF
NEW SOUTH WALES



NSW Injury Risk Management Research Centre,
University of New South Wales

SPORT/LEISURE INJURIES IN NEW SOUTH WALES

***Trends in sport/leisure injury
hospitalisations (2003-2005)
and the prevalence of non-
hospitalised injuries (2005)***

Rebecca Mitchell, Soufiane Boufous, Caroline F Finch

July 2008



UNSW, SYDNEY NSW 2052, AUSTRALIA
Telephone: +61 (2) 9385 4207, Facsimile: +61 (2) 9385 6040,
<http://www.irmrc.unsw.edu.au>

ISBN 978-0-9804866-3-6

Published by:
NSW Injury Risk Management Research Centre
University of New South Wales,
Sydney NSW 2052, Australia

Telephone: +61 (2) 9385 4207 Facsimile: +61 (2) 9385 6040 <http://www.irmrc.unsw.edu.au>

Recommended citation:

Mitchell R. Boufous S. Finch CF. Sport/leisure injuries in New South Wales: Trends in sport/leisure injury hospitalizations (2003-2005) and the prevalence of non-hospitalised injuries (2005). Sydney: New South Wales Injury Risk Management Research Centre, July 2008.

Table of Contents

List of Tables.....	i
List of Figures	ii
Acknowledgements	1
Executive Summary.....	2
Introduction.....	5
PART A. SPORT/LEISURE INJURY HOSPITALISATIONS IN NSW.....	7
Data Used and Analysis	7
Trends in Overall Injury Rates.....	9
Trends in Sport/Leisure Specific Injury Hospitalisation Rates	12
Trends in Injury Characteristics.....	13
In-hospital Procedures/Treatments for Sport/Leisure Injury	20
Implications	22
Recommendations	27
PART B. Self-reported injuries related to organised sport in NSW.....	29
Data Used and Analysis	29
Participation in Organised Sport.....	30
Proportion of Injured Organised Sport Participants	31
Treatment for most recent injury	32
Implications	33
Recommendations	33
REFERENCES	35
APPENDIX 1 ICD-10-AM SPORT/LEISURE ACTIVITY CODES.....	37
APPENDIX 2 PARTICIPATION IN SPORT AND RECREATIONAL ACTIVITIES DATA FROM ERASS	44
APPENDIX 3 COMMON PRINCIPAL PROCEDURES GIVEN TO SPORT/LEISURE INJURY HOSPITALISATION CASES NSW-BASED HOSPITALISATIONS OF NSW RESIDENTS, 2003–2005.....	46
APPENDIX 4 SPORTS INJURY QUESTIONS FROM THE NSW POPULATION HEALTH SURVEY PROGRAM	49

LIST OF TABLES

Table A.1 Annual number and rate of sport/leisure injury hospitalisations of NSW residents according to age group and sex, NSW, 2003–2005.....	10
Table A.2 Overall age group and sex specific sport/leisure injury hospitalisation rates of NSW residents in NSW, 2003–2005.....	11
Table A.3 Comparison of age group and sex specific population and participation-adjusted sport/leisure injury hospitalisation rates – NSW-based hospitalisations of NSW residents, 2003–2005.....	12
Table A.4 Population sport/leisure injury hospitalisations of NSW residents according to ICD-10-AM activity codes, NSW, 2003–2005.....	15
Table A.5 Participation-based sport/leisure injury hospitalisations of NSW residents aged 15+ years for select ICD-10-AM activity codes, NSW, 2003–2005.....	16
Table A.6 Most common external causes (mechanism) of sport/leisure injuries resulting in sport/leisure injury hospitalisation of NSW residents by year, NSW, 2003–2005.....	17
Table A.7 The twenty most common principal diagnoses of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005.....	19
Table A.8 The twenty most common principal procedures given to sport/leisure injury hospitalisation cases of NSW residents in NSW, 2003–2005.....	21
Table A.10 The ten most common principal procedures for sport/leisure injury hospitalisation cases of NSW residents by age group in NSW, 2003–2005.....	23
Table A.11 The ten most common principal procedures for sport/leisure injuries resulting in sport/leisure injury hospitalisation of NSW for selected team ball sports in NSW, 2003–2005.....	24
Table A.12 The ten most common principal procedures for sport/leisure injury hospitalisations of NSW residents for selected wheeled sports, equestrian activities, and ice and snow sports in NSW, 2003–2005.....	25
Table B.1 Percentage of individuals who participated in organised sport in the previous 12 months by age group and gender, 2005 NSW Population Health Survey.....	30
Table B.2 Distribution of the reported hours per week spent participating in organised sport in the previous 12 months by gender, 2005 NSW Population Health Survey.....	31
Table B.3 Frequency of reported injury amongst those who played organised sport in the previous 12 months by age group and gender, 2005 NSW Population Health Survey.....	31
Table B.4 Distribution of the number of injuries sustained by those who played organised sport in the previous 12 months by gender, 2005 NSW Population Health Survey.....	32
Table B.5 Proportion of injured individuals injured playing organised sport in the last 12 months by treatment type and gender, 2005 NSW Population Health Survey.....	32

LIST OF FIGURES

Figure A.1 Comparison of the annual distribution of the mechanism of sport/leisure injuries resulting in hospitalisation of NSW residents in NSW, 2003–2005	14
Figure A.2 Comparison of the annual distribution of the nature of injury (according to principal diagnosis) of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005	18
Figure A.3 Comparison of the annual distribution of the body region (according to principal diagnosis) of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005	18
Figure A.4 Comparison of the distribution of the locations where the events leading to sport/leisure injury hospitalisation of NSW residents occurred in NSW, 2003–2005.....	20

ACKNOWLEDGEMENTS

This project was funded by the NSW Sporting injuries Committee (NSWSIC) under its Research and Injury Prevention Scheme.

Rebecca Mitchell was supported by the NSW Injury Risk Management Research Centre (IRMRC) core funding, which is provided by the NSW Department of Health, the NSW Roads and Traffic Authority, and the NSW Motor Accidents Authority. Dr Soufiane Boufous was supported by the NSWSIC grant at the IRMRC during the analysis phase of this project; he contributed to the writing of this report as a Visiting Fellow at the IRMRC. Professor Caroline Finch was supported by an NHMRC Principal Research Fellowship and worked on this report in her capacity as an IRMRC Professorial Visiting Fellow and Research Professor in Human Movement Science at the University of Ballarat.

The authors would like to thank the Centre for Epidemiology and Research at the NSW Health Department for providing access to the Health Outcomes and Information Statistical Toolkit (HOIST) to access the sport/leisure injury hospitalisation and NSW Population Health Survey data analysed in this study.

The National Centre for Classification in Health provided the list of ICD-10-AM third edition sport/leisure activity codes reproduced in this report.

Comments on the draft report were received with thanks from: A/Prof Ann Williamson (IRMRC), Dr Shauna Sherker (IRMRC), Ms Sonya Jenkins (NSWSIC), Ms Karina Ryan (NSWSIC) and Ms Rosemary Perry (NSW Sport and Recreation) and NSW Health.

EXECUTIVE SUMMARY

Detailed information about the incidence and causes of sport/leisure injuries in NSW is needed to identify priority groups for action and suitable prevention and control measures. This report is the third in a series describing the pattern of sport/leisure injuries in NSW prepared by the NSW Injury Risk Management Research Centre (IRMRC). Previous reports have described sport/leisure injury deaths during 2000-2002 and sport/leisure injury hospitalisations during 2003-2004. The second report in the series also described the socio-demographic profile of sport/leisure injuries in NSW and discussed the quality and completeness of the International Classifications of Diseases (ICD-10-AM) coding schemes for identifying sport/leisure injury cases.

This report adds to information published in the previous reports by:

- adding an additional year to the description of sport/leisure injury hospitalisations to enable some trends in injury rates to be assessed for the 3-year period 2003 to 2005 (Part A). Rates are given for both the NSW resident population and as participation-based rates for 15+ year olds. This is important for assessing whether current preventive efforts are having an impact on sport/leisure injury hospitalisation rates in NSW;
- describing, for the first time, the range of in-hospital procedures that sport/leisure injury cases receive (Part A). To our knowledge, this information has not been described at the population level before. This is important for determining the severity of hospitalised sport/leisure injuries and to inform the delivery of health and medical services for sport/leisure injury treatment in NSW; and
- describing the self-reported experience of injuries during organised sporting activities from a population-based survey of NSW adults aged 16+ years in terms of age-and sex- specific rates and the most common sources of injury treatment (Part B). This is important for determining how common sport/leisure injuries are in the general community and the extent to which routine data collections of sport/leisure injury hospitalisations provide coverage of all such injuries.

Overall, the annual average rate of sport/leisure injury hospitalisations in NSW was 192.4 per 100,000 head of population, during 2003-2005. Rugby (union and league), soccer, football unspecified, and cycling were the activities most commonly conducted at the time of the injurious incident that resulted in sport/leisure injury hospitalisations. This indicates that severe sport/leisure injury is a significant issue in this State. An important limitation of the injury hospitalisation data, which has implications for the targeting of appropriate prevention strategies is that it is not possible to determine specifically if injuries occurred during organised sport, informal sport or leisure.

There has been an increase in sport/leisure injury hospitalisation rates over the period 2003-2005, though this was not statistically significant. This suggests that either currently implemented safety programs are not fully effective in preventing sport/leisure injuries or that not enough preventive effort is directed towards this important cause of injury morbidity in NSW. The fact that most participation-based injury hospitalisation rates were not significantly increased in 2005, relative to 2003, suggests that these trends are unlikely to be explained by increasing numbers of participants in these sports at least for the age groups with participation data. Some caution is needed in interpreting these trends as they are based on three time points only and the participation data does not cover all age ranges.

Participation-based injury hospitalisation rates appear to have increased for Australian rules football and cricket but declined in rugby football and equestrian activities during 2003-2005. On a per head of population basis, injury rates have increased significantly for motorcycle sports and football (unspecified). The specific reasons for these trends are not able to be determined from this data and changes in coding practices, as reflected in trends in the categories of football, unspecified and other specified sport and leisure activity may have contributed to these observations.

The most common in-hospital procedures received for hospitalised sport/leisure injury reflect the severity of these injuries. They were most commonly reductions of radius fractures, knee reconstructions, reductions of ankle/toe fractures and CT scans of the brain. It would also appear that sport/leisure injuries account for almost 60% of all knee reconstructions for injury hospitalisations in NSW, as well as more than 40% of all repairs of ankle/foot tendons/ligaments and more than one-third of all reductions of fractures to the tibia shaft.

It is known that hospitalisations only relate to the most severe sports injury cases and many sports injuries do not require hospitalisation. Moreover, the probability of admission to hospital is dependent on other factors such as the availability of surgical procedures and specialist staff to manage severe sport/leisure injury. This means that many more sport/leisure injuries occur in NSW that are treated outside of the formal hospital setting. To get an indication of the extent to which sport/leisure injuries in NSW residents are likely to require treatment in a hospital, information about the population incidence of all sport/leisure injury is required. One potentially valuable source of population-level sport/leisure injury frequency is from large scale population health surveys, such as those conducted by NSW Health. Information from respondents of the 2005 NSW Adult Health Survey is used to describe organised sport participation habits, the proportion of participants injured during this activity and the most common sources of sport/leisure injury treatment.

Almost one-in four adults who are participated in organised sport over 12 months reported being injured during this participation, highlighting the frequency with which such injuries occur. Most of these injuries were minor, however, with about 50% of cases either being self-treated or receiving no treatment for their injuries. Hospitalisation for an organised sport injury was not common, with under 3% of injured organised sport participants reporting this level of care. A further 6% of injured organised sport participants received treatment at an emergency department, indicating a relatively large proportion of injuries that are not included in usual estimates of the burden of sport/leisure injuries based on routinely collected health sector data in NSW.

Recommendations for Injury Prevention and Sports Safety

Given there has been no reduction in overall sport/leisure injury rates in NSW during 2003-2005, the extent to which effective sport/leisure safety programs have been developed and fully implemented in NSW needs to be determined. A strategic state-wide approach to sports safety, which includes the development of a sports policy framework involving government and non-government agencies, in conjunction with the development of safety guidelines for sports bodies to implement, needs to be adopted for the whole of NSW to reduce these rates in the future ¹.

Rugby, soccer, cycling, Australian rules football, cricket, and motorcycle sports should be the prime focus of increased injury prevention attention in NSW because of their predominance in the sport/leisure injury hospitalisation statistics and/or their association with increasing injury rates over the 2003-2005 period.

Given that almost one-in four adults injure themselves whilst playing organised sport in a 12 month period, and about half of these require some form of treatment, sports injury prevention should receive priority attention in both injury prevention and physical activity promotion activities in NSW.

Males should be a particular focus of sports prevention efforts, given the higher proportion of them self-reporting injury during organised sport participation, across all age groups aged 16+ years.

Recommendations for Improved Injury Surveillance in NSW

Consideration should be given towards the development of detailed routine injury surveillance systems for the sport/leisure activities with high or increasing injury hospitalisation rates, to continue to monitor these injury trends in specific sports and to guide intervention priorities and evaluation. Such systems will most likely require a multi-agency response including from Government departments of health and sport, the NSW Sporting Injuries Committee and peak sports bodies. The resulting surveillance should be wide, across many contexts and levels of participation, to determine the extent to which such injuries are related to organised sport participation.

Consideration should be given by agencies collecting routine injury and sport participation data to develop and use consistent definitions to aid standardisation of the identification of sports injuries and the calculation of robust participation-based injury rates.

Consideration should be given to enhancements to the ICD-10-AM coding manual that would allow the phase of play/actual activity at the time of injury to be reported (even if as a narrative) and for the type of activity to be properly differentiated between organised sport, informal sport and general play.

Solely using sport/leisure injury data from routinely collected hospital separations databases to estimate the burden of sport/leisure injury in NSW underestimates the public health burden associated with sport/leisure injury in NSW. Consideration should be given to assessing the feasibility of enhancing or establishing new routinely collected data collections to describe the burden of sport/leisure injuries on health service delivery and individuals. Different models for sport/leisure injury surveillance within various health care settings that commonly treat sport/leisure injuries such as emergency departments, sports medicine clinics, physiotherapist practices and general practitioners, in particular, should be explored.

Future NSW Population Health Survey questions about sport injury would be improved by the inclusion of additional questions requesting information about the type of sport /leisure activity at the time of injury, the type of injury sustained, and the time taken off work, school or daily activities as a result of the injury.

Recommendations for Further Research

A formal assessment of participation-based injury rates should be undertaken for children, using the latest ABS participation data.

Reasons for the relatively high level of unspecified and non-specific ICD-10-AM activity codes needs to be explored specifically for sport/leisure injury so that potential solutions for reducing these data inadequacies can be developed and implemented.

Given the relevance of data about the medical/surgical procedures received in hospital for health service planning, it is recommended that future research quantifies the full range of procedures received by hospitalised sport/leisure injury patients, in terms of their frequency, medical cost and public health burden.

INTRODUCTION

Sport and leisure activities (hereafter referred to as sport/leisure) play a prominent role in the lives of many Australians. In 2002, just under two-thirds of Australians aged 18+ years (62.4% of the adult population), representing around 9.1 million individuals, stated that they had participated in physical activities for recreation, exercise or sport in the previous 12 months². Participation and involvement in sport/leisure has many benefits for individuals, such as increased physical fitness, improved health and increased social interaction³.

Participation in sport can be at the elite or professional level, or as part of a broader-based organised sport, such as team-based competitions, or as part of school-based sport; it can also be more informal, such as for leisure, general recreation or backyard games. In Australia, around 4.6 million individuals aged 18 years or over (about half of all those participating in physical activities) stated that they participated in *organised* sports and physical recreation during the 12 months prior to 2002².

Unfortunately, participation in various sports, across all levels of participation from elite athletes to recreational players, can be associated with a risk of injury⁴. To inform population level prevention strategies, it is necessary to know the incidence and patterns of sport/leisure injury occurrence. In New South Wales (NSW), sport/leisure injuries have resulted in death and in injuries severe enough to require hospitalisation^{5,6}. Sport/leisure injuries can also involve presentations to emergency departments, general practitioners, visits to allied health professionals, such as physiotherapists, or may just require basic first aid and rest^{7,8}.

Sport/leisure injuries have been estimated to account for 13.9%-38.3% of all hospitalised injury in NSW⁶. They were estimated to cost around \$92.4 million in NSW during 1998-99 - \$40 million in direct costs and \$52.4 million in mortality and morbidity costs⁹. Other significant impacts of sport/leisure injuries are their effect on an individual's capacity to participate in further sport/leisure, their capacity to perform work or attend school, or to participate in other activities of daily living or social activities⁴.

Detailed information about the incidence and causes of sport/leisure injuries in NSW is needed to identify priority groups for action and suitable prevention and control measures^{5,6}. This report is the third in a series describing the pattern of sport/leisure injuries in NSW prepared by the NSW Injury Risk Management Research Centre (IRMRC). Previous reports have described sport/leisure injury deaths during 2000-2002^{5,6} and sport/leisure injury hospitalisations during 2003-2004^{5,6}. The second report in the series also described the socio-demographic profile of sport/leisure injuries in NSW and discussed the quality and completeness of the International Classifications of Diseases (ICD-10-AM) coding schemes for identifying sport/leisure injury cases^{5,6}.

This report adds to information published in the previous reports by:

- adding an additional year to the description of sport/leisure injury hospitalisations to enable some trends in injury rates to be assessed for the period 2003 to 2005 (Part A). This is important for assessing whether current preventive efforts are having an impact on sport/leisure injury hospitalisation rates in NSW;
- describing, for the first time, the range of in-hospital procedures that hospitalised sport/leisure injury cases receive (Part A). This is important for determining the severity of hospitalised sport/leisure injuries and to inform the delivery of health and medical services for sport/leisure injury treatment in NSW; and

- describing the self-reported experience of injuries during organised sporting activities from a population-based survey of NSW adults aged 16+ years in terms of age-and sex- specific rates and the most common sources of injury treatment (Part B). This is important for determining how common sport/leisure injuries are in the general community and the extent to which routine data collections of sport/leisure injury hospitalisations provide coverage of all such injuries.

Each part of this report begins with an overall statement of the issue being discussed and a full description of the methods and information sources used. The results from the relevant analyses are presented with an accompanying discussion of the implications of the findings for injury prevention and monitoring. Where relevant, some recommendations for improving the quality of the data collections and coding schemes are also given.

PART A. SPORT/LEISURE INJURY HOSPITALISATIONS IN NSW

Part A of this report describes trends in the frequency and rate of sport/leisure injury hospitalisations, of NSW residents in NSW-based hospitals, over the period 2003 to 2005. Rates are given for both the NSW resident population and, for 15+ year olds, as participation-based rates. In doing, so it provides an additional year of data to that included in previous IRMRC reports^{5 6}. It also enables an assessment of whether current broad-based sport/leisure injury preventive efforts are having an impact on hospitalised sport/leisure injury rates in NSW.

A description of the treatment provided to hospitalised sport/leisure injury patients, in terms of the most common procedures undertaken, is also provided. To our knowledge, this information has not been described at the population level before. This information is important for determining the severity of hospitalised sport/leisure injuries and to inform the delivery of health and medical services for sport/leisure injury treatment in NSW.

Data Used and Analysis

The NSW Admitted Patients Data Collection (APDC) (in previous reports this was named the Inpatient Statistics Collection, or ISC) includes details of all sport/leisure injury hospitalisations in NSW. It records all inpatient separations (discharges, transfers and deaths) from all public, private and repatriation hospitals, private day procedures centres and public nursing homes in NSW. Hospitals are required to submit details for every inpatient and for every episode of care. An episode of care either ends by the patient ending a period of stay in hospital (by discharge, transfer or death) or by the patient becoming a different type of patient within the same period of stay in hospital (e.g. the patient is admitted for an acute injury then later becomes a rehabilitation patient)¹⁰. Hereafter, the term "hospitalisation" should be taken to represent "hospital separation".

Due to the nature of the hospital data, the number of sport/leisure injuries hospitalisations is not equivalent to the number of incident cases. Patients who had been readmitted or transferred from one hospital to another and, in some instances, even within the same hospital, for treatment of the same injury may be recorded more than once. In the absence of a direct means to identify incident cases in the NSW APDC, the 'mode of separation' variable was used to exclude transfers and statistical discharges or transfers within the same hospital in order to minimise multiple counting of cases.

For the purposes of this report, only hospitalisations of NSW residents at NSW-based hospitals were extracted from the APDC. This was to ensure consistency with the previous IRMRC reports and because the available participation and population data only relate to NSW residents.

As with the two previous IRMRC sport/leisure injury reports^{5 6}, the ICD-10-AM third edition¹¹ was used to select appropriate cases for 2003 and 2004. The fourth edition was used for the 2005 data. The differences in respect to the coding of sport/leisure injury in the two editions were minor. Cases selected included all hospital separations in NSW, of NSW residents of any age, with an ICD-10-AM principal diagnosis indicating an injury, excluding poisoning (i.e. S00-T35, T66-T71, T73, T75, T95-T98) and an 'activity at the time of injury' code referring to sport/leisure activity (i.e. U50-U72) during the three calendar year period of 2003 to 2005. A detailed list of all relevant ICD-10-AM, third edition activity codes included is provided in Appendix 1. These codes were included on the assumption that the majority of cases selected would be related to participation in sport/leisure. For example, cycling was included, as it was assumed the majority of cases would be related to participation in cycling as a sport or leisure activity, rather than transportation to work. This assumption has also been made in prior analyses of sports injury cases treated at hospital^{5 6 12}. Sport/leisure activities have been classified in this report according to the ICD-10-AM groupings¹¹. Issues relating to the completeness

and other limitations of the ICD-10-AM activity and place codes have been reported in detail in the previous IRMRC sports injury report ^{5,6}.

The ICD-10-AM allows for the coding of place of occurrence of injury, which includes, among other categories, sports or athletics areas. However, this criterion was not used to select cases because our previous analyses ^{5,6} showed that use of the activity-codes, alone, identified most sports injury cases. Furthermore, some cases injured on a sport ground might not necessarily have been actually participating in a sport at the time; they may have been spectators, coaches, referees or passers-by, for example. Also, it is not necessarily true that all sport/leisure injuries will occur only in sports or athletics areas, and may also occur in schools, or natural settings.

Due to significant changes in the ICD-10-AM codes related to sport/leisure activities since 1998, this report only focuses on sport/leisure injury hospitalisations for the calendar years 2003 to 2005, for which the consistent revisions of the ICD-10-AM coding (in respect to sport/leisure injury) was used. Compared to previous versions of ICD-10-AM, the version used to code these three years of data contains a more detailed description of various sports, with 260 different categories provided by the ICD-10-AM 'activity while injured'. Unlike the ICD-10, and the earlier versions of ICD-10-AM, there is no simple delineation between sport/leisure and, unfortunately, this makes it impossible to identify injuries solely related to participation in organised sports. For example, if someone was injured while participating in football, it is not known if this was as a team member in a competitive game or as part of a kick-to-kick session in the backyard.

The frequency and rates of sport/leisure injuries were calculated in each year and for subgroups of interest, such as age and gender, as well as sport and activity type. The denominators used were the mid-year NSW population estimates (in the relevant subgroup) from Australian Bureau of Statistics (ABS) data obtained from HOIST ¹⁰. Year-specific hospitalised rates were age standardised to the 2001 Australian population to adjust for any differences that may have arisen from a change in the age structure of the population over the 2003-2005 period. All of the population data used in both numerators and denominators were restricted to NSW residents.

Information on the likely population at risk (i.e. the number of participants in sport/leisure) was derived from the relevant Exercise, Recreation and Sport Surveys (ERASS) ¹³⁻¹⁵. For consistency and direct comparability purposes, the same participation data was used in this report as for the previous IRMRC reports. The ERASS used telephone surveys to collect information on the participation of people aged 15+ years in physical activity for exercise, leisure and sport during the 12 months prior to the interview (Appendix 2). At the time of conducting the analyses for this report (mid 2007), there were no recent reliable estimates of child participation rates. For this reason, the participation-based rates provided in this report are only for people aged 15+ years. It is acknowledged that children's participation in organised sport was reported by the Australian Bureau of Statistics (ABS) in October 2007 and it is recommended that further work is undertaken in the future to determine appropriate sport/leisure injury rates in children.

In the ERASS survey, participation means active 'playing' participation and does not include coaching, refereeing and spectating or activities related to work or household chores. Participation figures include both organised and non-organised sport and practice and training sessions for these activities. The surveys used a random sample stratified by state and territory and the sample was selected from the Electronic White Pages; one person was randomly selected per dwelling to complete the interview.

While the classification of all sport/leisure activities in the sport/leisure injury hospitalisation data generally agrees with that of the ERASS participation data, caution is needed when examining participation rates for some individual sports or activities. This particularly applies to the category of 'other football' (rugby unspecified, touch football and other specified football, such as American tackle, Gaelic, Gridiron) and 'football unspecified', which do not have corresponding categories in the participation data. Those categories that refer to participation in 'other' or 'unspecified' sports and activities as defined by ICD-10-AM were included in this report. While such categories do not provide detailed information about the activity being undertaken at the time of injury, they need to be included

in the assessment of the overall burden, from a numerator point of view. Unfortunately, these cases cannot be included in participation-based rates.

Ninety-five percent confidence intervals (95% CI) were calculated for various rates. Poisson regression was used to examine the statistical significance of changes in the trend of sport/leisure hospitalised injuries rates over three years. Direct comparisons of the 95% CI for rates pertaining to particular subgroups of interest, across the three years, were used to identify significant changes in those rates (i.e. with non-overlapping CI). Whilst it is acknowledged that this approach has some statistical limitations, the fact that there were only three time points for the assessment of the trends, precludes a much more detailed analyses of them.

In all data presentations, cells with total case numbers less than five have not been shown in the tables in order to maintain confidentiality.

All analyses were conducted using SAS, version 8.02¹⁶.

Trends in Overall Injury Rates

Over the three-year period 2003 to 2005, there were 38,557 sport/leisure injury hospitalisations in NSW, with an overall annual age-standardised rate of 192.4 sport/leisure injury hospitalisations per 100,000 persons (95% CI 190.5-194.3). The overall rate of sport/leisure injury hospitalisations did not change significantly over the three year period. Age-standardised rates increased from 189.3/100,000 person in 2003 to 193.6 per 100,000 in 2005, but this increase was not statistically significant.

The average annual age-standardised sport/leisure injury hospitalisation rate for males (294.3 per 100,000 population) was around three times higher than the rate for females (91.7 per 100,000 population) (Table A.1). Males in all age groups, except for those aged 80+, had higher sport/leisure injury hospitalisation rates than females. Males aged 10-14 years (846.9 per 100,000 population) and 15-19 years (843.1 per 100,000 population), and females aged 10-14 years (275.6 per 100,000 population) or 5-9 years (213.9 per 100,000 population) had the highest average annual sport/leisure injury hospitalisation rates (Table A.2). Whilst the population-based hospitalisation rates increased in males over 2003-2005 (from 289.3 to 298.8), this was not statistically significant.

After adjusting for the estimated number of individuals aged 15+ years engaging in sport/leisure pursuits in the calculation of rates, males had just over 3.5 times the rate of sport/leisure injury hospitalisations as females (320.5 versus 84.8 per 100,000 participants, respectively). Males of all ages had higher rates of sport/leisure injury hospitalisation for sport/leisure injuries than females. Of those individuals who participated in sport/leisure activities, both males (759.3 per 100,000 participants) and females (129.9 per 100,000 participants) aged 15-24 years had the highest sport/leisure injury hospitalisation rate (Table A.3). In all cases, the participation-based rates were greater than the population-based rates, as would be expected, as the former are based on smaller denominators.

Table A.1 Annual number and rate of sport/leisure injury hospitalisations of NSW residents according to age group and sex, NSW, 2003–2005

	2003 ⁺		2004 ⁺		2005 ⁺	
	n	Rate (95% CI)	n	Rate (95% CI)	n	Rate (95% CI)
Gender						
Male	9,536	289.3 * (283.5, 295.1)	9,844	291.9 * (286.1, 297.6)	10,133	298.8 * (293.0, 304.6)
Female	3,021	90.5 * (87.3, 93.7)	2,945	86.3 * (83.2, 89.5)	3,078	89.6 * (86.5, 92.8)
Age group(years)						
0–4	269	62.3 (54.9, 69.8)	277	65.4 (57.7, 73.1)	258	60.2(52.9, 67.6)
5–9	1,208	267.9 (252.8, 283.0)	1,228	281.3 (265.6, 297.0)	1,111	251.5(236.8, 266.3)
10–14	2,551	559.3 (537.6, 580.9)	2,624	569.5 (547.8, 591.2)	2,631	572.4(550.6, 594.2)
15–19	2,177	484.7 (464.4, 505.0)	2,288	500.8 (480.3, 521.2)	2,367	521.2(500.3, 542.1)
20–24	1,448	329.4 (312.4, 346.3)	1,525	323.3 (307.1, 339.5)	1,624	350.7(333.7, 367.7)
25–29	1,262	268.7 (253.9, 283.5)	1,231	273.1 (257.8, 288.3)	1,341	289.6(274.1, 305.1)
30–34	982	194.1 (182.0, 206.2)	954	183.3 (171.7, 194.9)	1,008	194.8(182.8, 206.8)
35–39	663	133.0 (122.9, 143.1)	726	153.6 (142.4, 164.7)	791	160.2(149.0, 171.3)
40–44	565	110.8 (101.7, 120.0)	559	107.5 (98.6, 116.4)	634	122.6(113.1, 132.2)
45–49	464	100.8 (91.6, 110.0)	401	83.2 (75.0, 91.3)	431	88.7(80.3, 97.1)
50–54	269	62.1 (54.7, 69.6)	263	60.2 (52.9, 67.5)	293	66.1(58.5, 73.6)
55–59	195	53.2 (45.8, 60.7)	209	49.9 (43.1, 56.6)	200	48.3 (41.6, 55.0)
60–64	128	44.4 (36.7, 52.1)	153	49.4 (41.5, 57.2)	140	43.8 (36.6, 51.1)
65–69	99	40.7 (32.7, 48.7)	82	31.5 (24.7, 38.3)	111	42.1 (34.3, 49.9)
70–74	106	47.2 (38.2, 56.1)	93	43.5 (34.6, 52.3)	111	51.1 (41.6, 60.7)
75–79	87	46.7 (36.9, 56.5)	78	39.9 (31.0, 48.7)	88	45.7 (36.2, 55.2)
80+	84	38.0 (29.9, 46.1)	98	38.9 (31.2, 46.6)	72	28.7(22.1, 35.3)
Total	12,557	189.3[†] (186.0, 192.6)	12,789	188.5[†] (185.3, 191.8)	13,211	193.6[†] (190.3, 196.9)

* Age-standardised rate per 100,000 population.

[†] 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Table A.2 Overall age group and sex specific sport/leisure injury hospitalisation rates of NSW residents in NSW, 2003–2005

Age group (years)	Males		Females		Persons	
	n	Rate (95% CI)	n	Rate (95% CI)	n	Rate (95% CI)
0–4	480	72.7 (66.2, 79.2)	324	51.9 (46.3, 57.6)	804	62.6 (58.3, 66.9)
5–9	2,161	317.2 (303.8, 330.5)	1,386	213.9 (202.7, 225.2)	3,547	266.9 (258.1, 275.6)
10–14	5,961	843.1 (821.8, 864.4)	1,845	275.6 (263.0, 288.1)	7,806	567.1 (554.5, 579.6)
15–19	5,900	846.9(825.4, 868.4)	932	140.5 (131.4, 149.5)	6,832	502.3 (490.4, 514.2)
20–24	3,934	562.0 (544.5, 579.5)	663	98.3 (90.8, 105.8)	4,597	334.5 (324.8, 344.1)
25–29	3,243	468.3 (452.2, 484.4)	591	85.5 (78.6, 92.4)	3,834	277.1 (268.4, 285.9)
30–34	2,385	311.0 (298.5, 323.4)	559	72.0 (66.0, 77.9)	2,944	190.7 (183.8, 197.6)
35–39	1,623	221.7 (211.0, 232.5)	557	76.0 (69.7, 82.3)	2,180	148.8 (142.6, 155.0)
40–44	1,277	164.7 (155.6, 173.7)	481	62.4 (56.8, 68.0)	1,758	113.7 (108.4, 119.0)
45–49	899	126.3 (118.0, 134.5)	397	55.4 (50.0, 60.9)	1,296	90.7 (85.8, 95.7)
50–54	565	86.1 (79.0, 93.2)	260	39.6 (34.7, 44.4)	825	62.8 (58.5, 67.1)
55–59	345	56.9 (50.9, 62.9)	259	43.6 (38.3, 48.9)	604	50.3 (46.3, 54.4)
60–64	223	48.2 (41.9, 54.5)	198	43.5 (37.5, 49.6)	421	45.9 (41.5, 50.3)
65–69	163	43.1 (36.5, 49.7)	129	33.2 (27.4, 38.9)	292	38.1 (33.7, 42.4)
70–74	162	51.8 (43.8, 59.8)	148	43.2 (36.2, 50.1)	310	47.3(42.0, 52.5)
75–79	104	40.4 (32.6, 48.2)	149	47.0 (39.5, 54.5)	253	44.0 (38.6, 49.5)
80+	88	33.5 (26.5, 40.5)	166	36.0 (30.6, 41.5)	254	35.1 (30.8, 39.4)
Total	29,513	294.3 * (290.9, 297.2)	9,044	91.7 * (89.9, 93.6)	38,557	192.4 * (190.5, 194.3)

* Age-standardised rate per 100,000 population.

Table A.3 Comparison of age group and sex specific population and participation-adjusted sport/leisure injury hospitalisation rates – NSW-based hospitalisations of NSW residents, 2003–2005

Age group (years)	n	Rate per 100,000 population (95% CI)	Rate per 100,000 participants (95% CI)
MALES			
15–24	9,834	704.1 (690.2,718.0)	759.3 (744.3,774.3)
25–34	5,628	385.6 (375.5,395.7)	435.4 (424.0,446.8)
35–44	2,900	192.4 (185.4,199.4)	233.1 (224.6,241.6)
45–54	1,464	107.0 (101.5,112.5)	133.7 (126.9,140.5)
55–64	568	53.1 (48.7,57.5)	69.8 (64.1,75.5)
65+	517	42.7 (39.0,46.4)	66.0 (60.3,71.7)
Total	20,911	261.0 (257.5,264.5) *	320.5 (316.2,324.8) *
FEMALES			
15–24	1,595	119.2 (113.4,125.0)	129.9 (123.5,136.3)
25–34	1,150	78.3 (73.8,82.8)	93.2 (87.8,98.6)
35–44	1,038	69.0 (64.8,73.2)	84.6 (79.5,89.7)
45–54	657	47.8 (44.1,51.5)	60.6 (56.0,65.2)
55–64	457	43.6 (39.6,47.6)	57.5 (52.2,62.8)
65+	592	39.2 (36.0,42.4)	65.3 (60.0,70.6)
Total	5,489	66.6 (64.8,68.4) *	84.8 (82.6,87.0) *
PERSONS			
15–24	11,429	417.9 (410.3,425.5)	452.9 (444.6,461.2)
25–34	6,778	231.5 (226.0,237.0)	268.3 (261.9,274.7)
35–44	3,938	130.8 (126.7,134.9)	159.3 (154.3,164.3)
45–54	2,121	77.4 (74.1,80.7)	97.3 (93.2,101.4)
55–64	1,025	48.4 (45.4,51.4)	63.7 (59.8,67.6)
65+	1,109	40.8 (38.4,43.2)	65.6 (61.7,69.5)
Total	26,400	162.4 (160.4,164.4) *	203.1(200.7,205.5) *

*Age-standardised rate per 100,000 population or per 1000,000 participants, as indicated in the column heading

Trends in Sport/Leisure Specific Injury Hospitalisation Rates

Rugby (league and union) and soccer had the highest sport/leisure injury hospitalisation rates per 100,000 population of all sports (Table A.4). Other common sport/leisure activities being performed at the time of injury were football (unspecified), Australian rules football, cycling, skating and rollerblading, motorcycle sports, equestrian activities, and ice and snow sports (Table A.4).

Table A.4 also shows trends in population-based injury rates across specific sport/leisure categories. On a population basis, injury rates were significantly increased in 2005, relative to 2003, for the three categories of:

- *football, unspecified* – this result is likely to reflect changes in coding practice as it is not possible to determine which football codes the larger number of cases belong to, though, on a

proportionate participation basis, it would be expected that many cases would be associated with one of the two rugby codes

- *motorcycle (inc. dirt bike racing and jumping)*
- *other specified sport and exercise activity* – this result is unlikely to reflect a true increase in the number of injuries in any one activity, because it is a general category of many activities.

There was also a significant decline in the rate of hospitalisations in the *leisure activity, not elsewhere classified* category between 2003 and 2005. It is possible that this decline reflects the increases in the two categories of *football, unspecified* and *other specified sport and exercise activity* noted above.

Table A.5 shows participation-based injury rates across specific sport/leisure categories in 15+ year olds. After taking into account participation rates for people aged 15+ years, the following sport/leisure activities were associated with apparent statistically significant increases in injury hospitalisation rates (per 100,000 participants) in 2003 compared to 2005:

- Australian rules football
- cricket.

Participation-based injury hospitalisation rates with apparently lower participation-based rates in 2005 than in 2003 were:

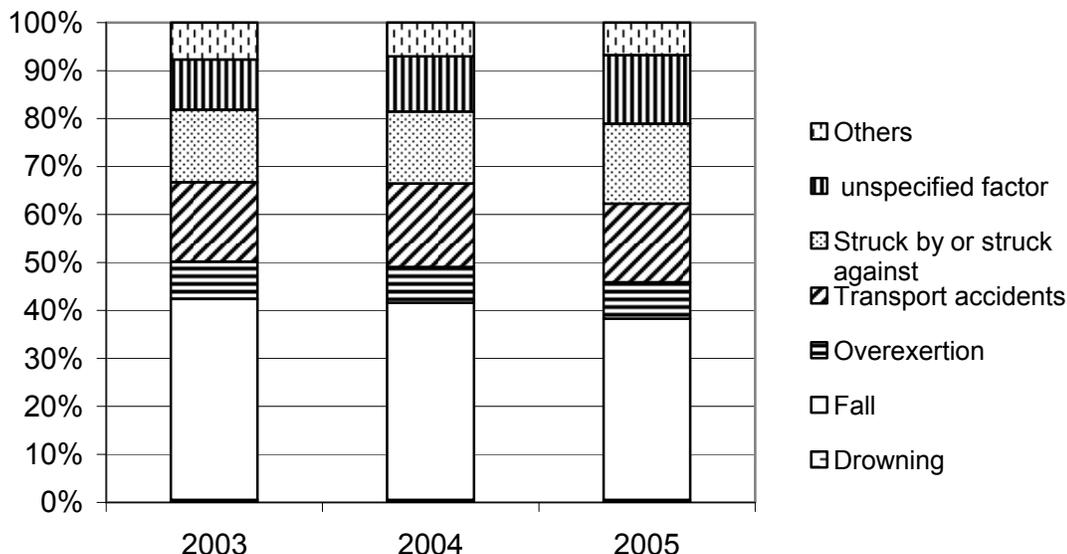
- football, rugby (league, union); and
- equestrian activities.

However, these results for the football codes, in particular, need to be interpreted with some caution because of the high numbers of “football unspecified” hospitalisations, which could not be related to football participation data. It is possible that the injury rates in Table A.5 are under estimates, given these unspecified cases.

Trends in Injury Characteristics

There were no significant trends in the mechanisms of the injuries leading to sport/leisure injury hospitalisation across 2003-2005 (Figure A.1). Overall, *falls* (40.2%), *transport accidents* (16.8%), and *being struck by or struck against objects* (15.6%) were the three most common injury mechanisms that resulted in sport/leisure injury hospitalisation (Figure A.1).

Figure A.1 Comparison of the annual distribution of the mechanism of sport/leisure injuries resulting in hospitalisation of NSW residents in NSW, 2003–2005 ⁺



⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Table A.6 shows trends in the most common external causes of the sport/leisure injury hospitalisations. Overall, just over one in ten (14.4%) sport/leisure activities that resulted in a sport/leisure injury hospitalisation occurred following *a fall on the same level due to a collision with, or being pushed, by another person*, such as might occur during a tight contest for a ball on a football field. Other common injury mechanisms during sport/leisure activities that resulted in sport/leisure injury hospitalisation were *overexertion and strenuous or repetitive movements* (7.6%), and *other falls on the same level* (6.8%) (Table A.6). A relatively large number of cases were categorised as *exposure to unspecified factors* (10.5%), indicating that there was no specific information about how these injuries occurred in the hospital records. There is a suggestion of an increase in the number of *other fall on same level* (W18), *striking against or bumped into by another person* (W51) and *exposure to other specified factor* (X58) injuries between 2003 and 2005.

Table A.4 Population sport/leisure injury hospitalisations of NSW residents according to ICD-10-AM activity codes, NSW, 2003–2005

Sport/leisure activity	2003 ⁺		2004 ⁺		2005 ⁺	
	n	Rate * (95% CI)	n	Rate * (95% CI)	n	Rate * (95% CI)
Team ball sports						
<i>Football, rugby (league, union)</i>	1,475	22.1 (20.9, 23.2)	1,577	23.4 (22.3, 24.6)	1,585	23.2 (22.1, 24.4)
<i>Football, soccer</i>	1,384	20.7 (19.6, 21.8)	1,505	22.4 (21.2, 23.5)	1,522	22.3 (21.2, 23.4)
<i>Football, Australian rules</i>	449	6.7 (6.1, 7.3)	453	6.7 (6.1, 7.3)	450	6.6 (6.0, 7.2)
<i>Football, other specified</i>	309	4.6 (4.1, 5.1)	280	4.2 (3.7, 4.6)	361	5.3 (4.7, 5.8)
<i>Football, unspecified</i>	729	10.9 (10.1, 11.7)	843	12.5 (11.7, 13.4)	919	13.5 (12.6, 14.3)
<i>Basketball</i>	287	4.3 (3.8, 4.8)	298	4.4 (3.9, 4.9)	325	4.8 (4.2, 5.3)
<i>Netball</i>	275	4.1 (3.6, 4.6)	266	4.0 (3.5, 4.4)	340	5.0 (4.5, 5.5)
Team bat or stick sports						
<i>Cricket</i>	252	3.8 (3.3, 4.2)	250	3.7 (3.3, 4.2)	293	4.3 (3.8, 4.8)
<i>Field hockey</i>	52	0.8 (0.6, 1.0)	59	0.9 (0.7, 1.1)	60	0.9 (0.7, 1.1)
Individual water sports						
<i>Surfing and boogie boarding</i>	219	3.3 (2.8, 3.7)	272	4.0 (3.6, 4.5)	277	4.1 (3.6, 4.5)
<i>Swimming</i>	157	2.3 (2.0, 2.7)	193	2.9 (2.5, 3.3)	157	2.3 (1.9, 2.7)
Ice and snow sports	417	6.2 (5.6, 6.8)	424	6.3 (5.7, 6.9)	407	6.0 (5.4, 6.5)
Individual athletic activities	185	2.8 (2.4, 3.2)	196	2.9 (2.5, 3.3)	178	2.6 (2.2, 3.0)
Acrobatic sports	115	1.7 (1.4, 2.0)	104	1.5 (1.2, 1.8)	117	1.7 (1.4, 2.0)
Racket sports						
<i>Squash</i>	78	1.2 (0.9, 1.4)	58	0.9 (0.6, 1.1)	41	0.6 (0.4, 0.8)
<i>Other racquet sports</i>	182	2.7 (2.3, 3.1)	160	2.4 (2.0, 2.7)	191	2.8 (2.4, 3.2)
Target and precision sports	127	1.9 (1.6, 2.2)	130	1.9 (1.6, 2.3)	140	2.1 (1.7, 2.4)
Combative sports	166	2.5 (2.1, 2.9)	146	2.2 (1.8, 2.5)	168	2.5 (2.1, 2.8)
Equestrian activities	429	6.4 (5.8, 7.0)	445	6.6 (6.0, 7.2)	443	6.5 (5.9, 7.1)
Wheeled motor and non-motor sports						
<i>Cycling</i>	561	8.4 (7.7, 9.1)	659	9.8 (9.0, 10.5)	650	9.5 (8.8, 10.3)
<i>Skating and rollerblading</i>	493	7.4 (6.7, 8.0)	477	7.1 (6.5, 7.7)	521	7.6 (7.0, 8.3)
<i>Motorcycle (inc. dirt bike racing and jumping)</i>	457	6.8 (6.2, 7.5)	600	8.9 (8.2, 9.6)	621	9.1 (8.4, 9.8)
<i>Other wheeled motor sports</i>	57	0.9 (0.6, 1.1)	77	1.1 (0.9, 1.4)	73	1.1 (0.8, 1.3)
Other specified sport and exercise activity	1,543	23.1 (21.9, 24.2)	1,516	22.5 (21.4, 23.7)	1,739	25.5 (24.3, 26.7)
Leisure activity, not elsewhere classified	2,159	32.3 (30.9, 33.7)	1,801	26.8 (25.5, 28.0)	1,633	23.9 (22.8, 25.1)
Total	12,557	189.3 (186.0, 192.6)	12,789	188.5 (185.3, 191.8)	13,211	193.6 (190.3, 196.9)

* Age-standardised rate per 100,000 population.

⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Note: The above table does not list of all available codes, rather it lists the most commonly reported codes only. In cases, where only a small number of cases were reported (e.g. unspecified team ball sports, or other team ball sport), these have been combined into one of the last two categories in this table.

Table A.5 Participation-based sport/leisure injury hospitalisations of NSW residents aged 15+ years for select ICD-10-AM activity codes, NSW, 2003–2005

Sport/leisure activity	2003 ⁺		2004 ⁺		2005 ⁺	
	n	Rate (95% CI)	n	Rate (95% CI)	n	Rate (95% CI)
Team ball sports						
<i>Football, rugby (league, union)</i>	1,086	793.9 (748.6, 839.2)	1,130	678.3 (640.1, 716.5)	1,161	585.2 (551.6, 618.7)
<i>Football, soccer</i>	997	268.9 (252.4, 285.3)	1,118	267.2 (251.8, 282.7)	1,129	293.6 (276.5, 310.7)
<i>Football, Australian rules</i>	331	630.5 (564.7, 696.2)	340	788.9 (708.4, 869.3)	342	994.2 (889.3, 1,099.0)
<i>Basketball</i>	206	120.4 (104.1, 136.7)	185	134.4(115.2, 153.7)	207	135.8 (117.3, 154.3)
<i>Netball</i>	200	134.9 (116.3, 153.4)	185	121.2 (103.8, 138.5)	265	157.5 (138.5, 176.4)
Team bat or stick sports						
<i>Cricket</i>	195	103.4 (89.0, 117.8)	200	91.4 (78.8, 104.0)	240	147.3 (128.7, 166.0)
Individual water sports						
<i>Surfing and boogie boarding</i>	204	136.3 (117.7, 154.8)	224	96.4 (83.9, 109.0)	242	137.3 (120.0, 154.5)
<i>Swimming</i>	79	8.6 (6.7, 10.5)	107	11.1 (9.0, 13.2)	94	10.8 (8.6, 13.0)
Ice and snow sports	372	422.7 (380.7, 464.8)	371	277.1 (249.3, 304.9)	347	362.6 (324.5, 400.7)
Individual athletic activities	132	3.8 (3.1, 4.4)	129	3.6 (3.0, 4.2)	115	4.2 (3.5, 5.0)
Acrobatic sports	19	#	18	131.1 (79.0, 183)	19	83.0 (45.7, 120.3)
Racquet sports	246	39.5 (34.6, 44.4)	199	29.8 (25.7, 34.0)	215	36.0 (31.2, 40.8)
Target and precision sports	113	17.7 (14.4, 21.0)	119	16.8 (13.8, 19.8)	126	18.1 (14.9, 21.3)
Equestrian activities	289	617.5 (548.6, 686.5)	311	464.9 (414.4, 515.3)	307	427.0 (379.3, 474.6)
Wheeled motor and non-motor sports						
<i>Motor sports</i>	402	857.1 (777.0, 937.3)	517	711.1 (652.1, 770.2)	550	971.7 (890.9, 1,052.5)
<i>Cycling</i>	293	72.5 (64.2, 80.7)	344	71.4 (63.9, 78.9)	344	72.5 (64.9, 80.2)

Note: only ICD-10-AM activity code categories with comparable ABS participation data are able to be presented.

⁺ Age-standardised rate per 100,000 participants.

⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Participation data not available for 2003

Figure A.2 shows that there was no change in the overall distribution of the nature of injury in the sport/leisure injury hospitalisation cases over 2003-2005. Just over half (55.2%) of all injuries that occurred during sport/leisure activities that resulted in hospitalisation were fractures, as expected, given that hospitalisation data represent the severe end of the sport/leisure injury spectrum. Sprains or strains (7.9%), dislocations (7.1%), and open wounds (5.9%) were also common types of injuries that resulted in sport/leisure injury hospitalisation (Figure A.2).

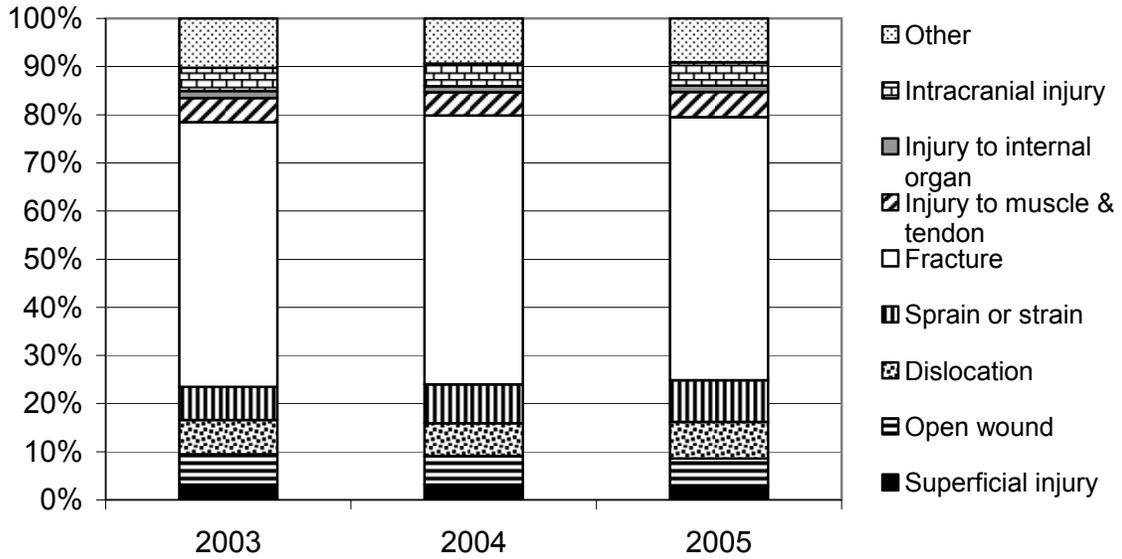
Figure A.3 compares the annual distribution of the principal injured body region and shows no significant trends over 2003-2005. Just less than three-quarters (71.5%) of all sport/leisure injuries involved the upper (41.1%) or lower (30.4%) limbs. Injuries to the head (17.1%) were also common for among sport/leisure injury hospitalisations (Figure A.3).

Table A.6 Most common external causes (mechanism) of sport/leisure injuries resulting in sport/leisure injury hospitalisation of NSW residents by year, NSW, 2003–2005

ICD-10-AM code	ICD 10 description	2003 ⁺		2004 ⁺		2005 ⁺	
		n	%	n	%	n	%
W03	Fall on same level due to collision with, or pushing by, another person	1,768	14.1	1,877	14.7	1,891	14.3
X50	Overexertion and strenuous or repetitive movements	976	7.8	962	7.5	1,004	7.6
W18	Other fall on same level	747	5.9	764	6.0	1,124	8.5
W01	Fall on same level from slipping, tripping and stumbling	721	5.7	671	5.2	677	5.1
W02	Fall involving ice skates, skis, roller skates or skateboards	670	5.3	641	5.0	704	5.3
W50	Hit, struck, kicked, twisted, bitten or scratched by another person	643	5.1	633	4.9	688	5.2
W21	Striking against or struck by sports equipment	608	4.8	586	4.6	662	5.0
W09	Fall involving playground equipment	571	4.5	568	4.4	471	3.6
W51	Striking against or bumped into by another person	461	3.7	473	3.7	631	4.8
V80	Animal rider or occupant of animal-drawn vehicle injured in transport accident	408	3.2	438	3.4	425	3.2
V18	Other fall on same level	404	3.2	437	3.4	386	2.9
V28	Motorcycle rider injured in non-collision transport accident	362	2.9	390	3.0	394	3.0
W19	Unspecified fall	283	2.3	266	2.1	284	2.1
V19	Pedal cyclist injured in other and unspecified transport accident	217	1.7	256	2.0	284	2.1
V29	Motorcycle rider injured in other and unspecified transport accident	147	1.2	196	1.5	182	1.4
W22	Striking against or struck by other objects	137	1.1	144	1.1	164	1.2
W17	Other fall from one level to another	136	1.1	135	1.1	135	1.0
W16	Diving or jumping into water causing injury other than drowning	94	0.7	107	0.8	109	0.8
X59	Exposure to unspecified factor	1,311	10.4	1,479	11.6	1,244	9.4
X58	Exposure to other specified factors	246	2.0	253	2.0	338	2.6
	All other injury mechanism	1,647	13.1	1,513	11.8	1,414	10.7
	Total	12,577	100.0	12,789	100.0	13,211	100.0

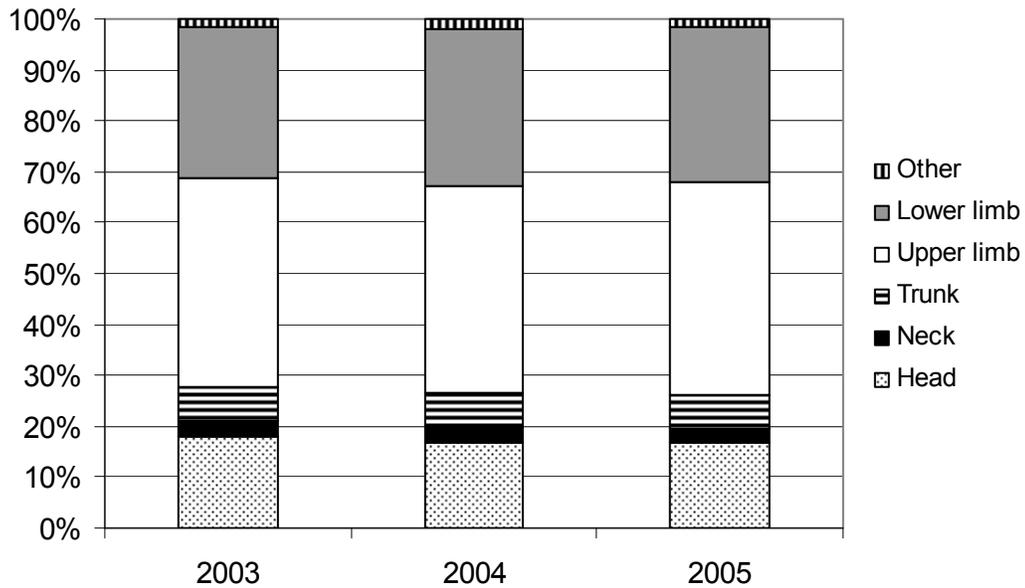
⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Figure A.2 Comparison of the annual distribution of the nature of injury (according to principal diagnosis) of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005 *



* 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Figure A.3 Comparison of the annual distribution of the body region (according to principal diagnosis) of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005 *



* 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

Table A.7 lists the 20 most common principal diagnoses of the sport/leisure injury hospitalisations. Overall, fractures of the forearm (19.8%) and lower leg, including ankle, (11.8%) were the two most common specific principal diagnoses that led to a sport/leisure injury hospitalisation. Other common principal diagnoses were *dislocations, sprains and strains of joints and ligaments of the knee* (8.1%), *fractures at the wrist and hand level* (7.4%), *fractures of the shoulder and upper arm* (5.4%), and *fractures of the skull and facial bones* (5.2%) (Table A.7). Comparison of the distributions in each year, suggests a possible increase in the number of *dislocation, sprain and strain of joints and ligaments of knee* (S83) and *fracture at wrist and hand level* (S62) injuries in 2005 compared to 2003.

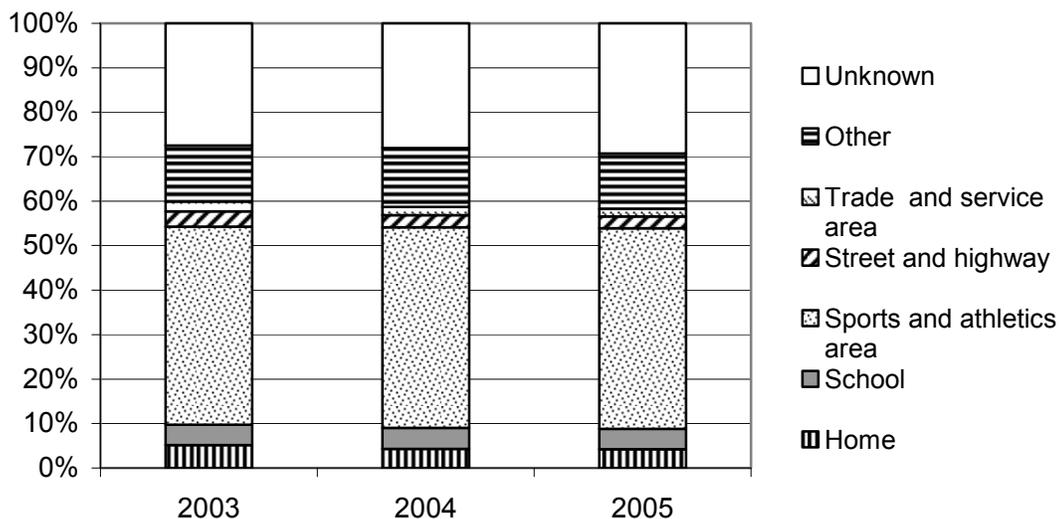
Table A.7 The twenty most common principal diagnoses of sport/leisure injury hospitalisations of NSW residents in NSW, 2003–2005

ICD 10-AM code	ICD 10 description	2003 ⁺		2004 ⁺		2005 ⁺	
		n	%	n	%	n	%
S52	Fracture of forearm	2,572	20.5	2,523	19.7	2,557	19.4
S82	Fracture of lower leg, including ankle	1,474	11.7	1,607	12.6	1,486	11.2
S83	Dislocation, sprain and strain of joints and ligaments of knee	895	7.1	1,042	8.2	1,193	9.0
S62	Fracture at wrist and hand level	849	6.8	933	7.3	1,056	8.0
S42	Fracture of shoulder and upper arm	653	5.2	696	5.4	717	5.4
S02	Fracture of skull and facial bones	650	5.2	679	5.3	691	5.2
S06	Intracranial injury	608	4.8	594	4.6	639	4.8
S43	Dislocation of shoulder joint	388	3.1	408	3.2	439	3.3
S86	Injury of muscle and tendon at lower e.g. level	417	3.3	359	2.8	367	2.8
S09	Other and unspecified injuries of head	377	3.0	346	2.7	349	2.6
S01	Open wound of head	385	3.1	348	2.7	343	2.6
S22	Fracture of rib(s), sternum and thoracic spine	198	1.6	183	1.4	181	1.4
S19	Other and unspecified injuries of neck	185	1.5	162	1.3	159	1.2
S72	Fracture of femur	170	1.4	173	1.4	183	1.4
S63	Dislocation, sprain and strain of joints and ligaments at wrist and hand level	160	1.3	146	1.1	164	1.2
S92	Fracture of foot, except ankle	166	1.3	140	1.1	168	1.3
S39	Other and unspecified injuries of abdomen, lower back and pelvis	142	1.1	135	1.1	138	1.0
S00	Superficial injury of head	125	1.0	133	1.0	126	1.0
S32	Fracture of lumbar spine and pelvis	112	0.9	145	1.1	135	1.0
S81	Open wound of lower leg	112	0.9	127	1.0	121	0.9
	All other diagnoses	1,919	15.2	1,910	15.0	1,999	15.1
	Total	12,557	100.0	12,789	100.0	13,211	100.0

⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

There was no significant difference in the places where the sport/leisure injury hospitalisations occurred during 2003-2005 (Figure A.4). Overall, *sports and athletic areas* (44.9%) were the most common location where sport/leisure injury occurred. However, 41.0% of the locations were identified as either *other specified locations* (12.7%) or *unknown locations* (28.3%) (Figure A.4).

Figure A.4 Comparison of the distribution of the locations where the events leading to sport/leisure injury hospitalisation of NSW residents occurred in NSW, 2003–2005 ⁺



⁺ 2003-2004, ICD-10-AM 3rd Edition; 2005, ICD-10-AM 4th Edition

In-hospital Procedures/Treatments for Sport/Leisure Injury

Examining the principal procedures performed on admission to hospital following a sport/leisure injury identified a wide range of hospital-based treatments or procedures. Table A.8 lists the 20 most commonly received in-hospital procedures, as determined from the principal procedure code for each case, received for sport/leisure injury hospitalisations during 2003-2005. A fuller list is given in Appendix 3.

The most common principal procedures performed were closed *reductions of fractures of the radius* (12.8%), *reconstruction procedures on the knee* (5.3%), *open reductions of fractures of the ankle or toe* (4.2%), and *computerised tomography (CT scan) of the brain* (3.8%) (Table A.8).

The principal procedures conducted on a sport/leisure hospitalisation cases, as a proportion of procedures conducted for all injuries, ranged from 6.0% to 59.2%. *Reconstruction of the knee* (59.2%), the *repair of tendons or ligaments in the ankle or foot* (43.1%), and *closed reductions of the fracture of the shaft of the tibia* (39.6%) were all principal procedures commonly conducted for sport/leisure injury. These sport/leisure cases accounted for over one-third of the types of procedures conducted in all hospitalised injuries (Table A.8).

Table A.8 also presents the relative contribution of sport/leisure injuries to all injury cases requiring each principal procedure. For example, 59.2% of all injury hospitalisation cases receiving *reconstruction procedures on knee* were associated with sport/leisure, suggesting that this procedure is particularly relevant to sport/leisure injuries. Other categories of particular relevance to sport/leisure injuries (accounting for 25% or more of all such principal procedures) are: *repair of tendon or ligament of ankle or foot* (43.1%), *closed reduction of fracture of shaft of tibia* (39.6%), *reduction of dislocation*

of clavicle, scapula or shoulder (31.1%), closed reduction of phalanx of hand (29.8%), open reduction of fracture of shaft of tibia (28.3), reduction of fracture of shaft of radius and ulna (27.9%) and closed reduction of fracture of radius (26.7%).

Table A.8 The twenty most common principal procedures given to sport/leisure injury hospitalisation cases of NSW residents in NSW, 2003–2005

ICD-10-AM procedure code	Procedure	Sport/leisure injuries n	% of all sport/leisure injury cases with this principal procedure	% of all all-cause injury hospitalisations with this principal procedure that were associated with sport/leisure ¹
1427	Closed reduction of fracture of radius	4,946	12.8	26.7
1522	Reconstruction procedures on knee	2,033	5.3	59.2
1539	Open reduction of fracture of ankle or toe	1,638	4.2	23.5
1952	Computerised tomography of brain	1,457	3.8	11.2
1916	Generalised allied health interventions	1,149	3.0	6.0
1542	Repair of tendon or ligament of ankle or foot	964	2.5	43.1
1429	Open reduction of fracture of radius	857	2.2	20.0
1431	Reduction of fracture of shaft of radius and ulna	820	2.1	27.9
1402	Reduction of dislocation of clavicle, scapula or shoulder	789	2.0	31.1
1509	Closed reduction of fracture of shaft of tibia	717	1.9	39.6
1635	Repair of wound of skin and subcutaneous tissue	682	1.8	6.3
1454	Closed reduction of phalanx of hand	669	1.7	29.8
1365	Reduction of fracture of nasal bone	615	1.6	18.5
1959	Computerised tomography of spine	611	1.6	16.4
1457	Open reduction of fracture of phalanx of hand	603	1.6	19.5
1413	Closed reduction of fracture of humerus or elbow	568	1.5	22.6
1453	Closed reduction of fracture of metacarpus of hand	411	1.1	17.6
1566	Excision procedures on other musculoskeletal sites	409	1.1	6.2
1456	Open reduction of fracture of metacarpus of hand	405	1.1	16.9
1510	Open reduction of fracture of shaft of tibia	397	1.0	28.3

¹ Percentage of all instances of this procedure performed for injury hospitalizations that related to sport/leisure injury.

The ten most common types of principal procedures performed during a sport/leisure injury hospitalisation differed by age group. As a proportion of all such procedures, *reduction of fractures of the shaft of the radius and ulna* (48.2%) and *closed reduction of fractures of the ulna or olecranon* (47.8%) were procedures conducted for children aged ≤ 9 years, accounting for the highest proportion of these two procedures compared to all other age groups (Table A.10). For youths aged 10-19 years, *closed reduction of fractures of the ankle or toe* (63.4%), and for individuals aged 20-44 years, *repairs of tendons or ligaments of the ankle or foot* (73.5%) represented the most common procedures conducted for these age groups. The majority of *arthroplasties of the hip* (83.9%) were conducted for individuals aged 70+ years.

The ten most common principal procedures following a hospitalised sport/leisure injury also varied by sport/leisure activity. Of the *reduction of fractures of the mandible or maxilla* performed for all sport/leisure hospitalised injuries, just less than one-third were for rugby-related injuries (union and league). Likewise, just less than one-third of all *closed reduction fractures of the shaft of the tibia* were performed for soccer-related injuries. Of the *repairs of tendons or ligaments of the ankle or foot*, 16.1% were for netball-related injuries (Table A.11).

Of the *repairs of ligaments or capsules of the phalangeal joint of the hand* performed for all sport/leisure hospitalised injuries, 39.7% were performed for ice and snow sport/leisure injuries. Around 17% of all *reductions of fractures of the pelvis or femur* were performed for motorcycling-related injuries. Just over one in ten of all *excision procedures on other musculoskeletal sites* (13.9%) were performed for injuries received while cycling and *closed reductions of fractures of the radius* (11.7%) were common skating and rollerblading injuries.

Implications

Overall, the annual average age-standardised rate of sport/leisure injury hospitalisations in NSW was 192.4 per 100,000 head of population, during 2003-2005. This indicates that severe sport/leisure injury is a significant issue in this State.

Importantly, this analysis of routinely collected hospitalisation data for NSW, has shown that there has been a non-statistically significant increase in sport/leisure injury hospitalisation rates over the period 2003-2005. This suggests that either currently implemented safety programs are not fully effective in preventing sport/leisure injuries or that not enough preventive effort is directed towards this important cause of hospitalised injury morbidity in NSW. The fact that most participation-based injury hospitalisation rates did not increase significantly in 2005, relative to 2003 (at least in adults aged 15+ years), suggests that these trends are unlikely to be explained solely by increasing numbers of participants in these sports. Notwithstanding these trends, rugby (union and league), soccer, football unspecified, and cycling were the activities most commonly conducted at the time of the injurious incident that resulted in sport/leisure injury hospitalisations.

There is a suggestion that participation-based injury hospitalisation rates may have increased for the sports of Australian rules football and cricket, but declined in rugby, football and equestrian activities. On a per head of population basis, injury rates appear to have increased significantly for motorcycle sports and football (unspecified). However, given the large number of "football unspecified" cases, these trends need to be interpreted with caution. The specific reasons for these trends are not able to be determined from this data and changes in coding practices, as reflected in trends in the categories of football, unspecified and other specified sport and leisure activity may have contributed to these observations. Unfortunately, this data does not distinguish whether the injuries were assigned to a specific activity that occurred during formal sport or more leisure time forms of the activity (e.g. kick-to-kick in a park or at home).

Table A.10 The ten most common principal procedures for sport/leisure injury hospitalisation cases of NSW residents by age group in NSW, 2003–2005

ICD-10-AM procedure code	Procedure	All ages n	Age group (years)				
			≤ 9 n (%)	10-19 n (%)	20-44 n (%)	45-69 n (%)	70+ n (%)
1427	Closed reduction of fracture of radius	4,946	1,250 (25.3)	2,845 (57.5)	501 (10.1)	267 (5.4)	83 (1.7)
1522	Reconstruction procedures on knee	2,033		487 (24.0)	1,397 (68.7)	148 (7.3)	
1539	Open reduction of fracture of ankle or toe	1,638		500 (30.5)	894 (54.6)	222 (13.6)	17 (1.0)
1952	Computerised tomography of brain	1,457	127 (8.7)	679 (46.6)	504 (34.6)	111 (7.6)	36 (2.5)
1916	Generalised allied health interventions	1,149	91 (7.9)	344 (29.9)	432 (37.6)	172 (15.0)	110 (9.6)
1542	Repair of tendon or ligament of ankle or foot	964			709 (73.5)	227 (23.5)	
1429	Open reduction of fracture of radius	857			423 (49.4)	128 (14.9)	34 (4.0)
1431	Reduction of fracture of shaft of radius and ulna	820	395 (48.2)	377 (46.0)			
1402	Reduction of dislocation of clavicle, scapula or shoulder	789			491 (62.2)	69 (8.7)	21 (2.7)
1509	Closed reduction of fracture of shaft of tibia	717	98 (13.7)	410 (57.2)			
1635	Repair of wound of skin and subcutaneous tissue	682	138 (20.2)			65 (9.5)	38 (5.6)
1454	Closed reduction of phalanx of hand	669	78 (11.7)	379 (56.7)			
1365	Reduction of fracture of nasal bone	615		311 (50.6)			
1413	Closed reduction of fracture of humerus or elbow	568	392 (69.1)				
1414	Open reduction of fracture of humerus or elbow	372	106 (28.5)				
1428	Closed reduction of fracture of ulna or olecranon	138	66 (47.8)				
1537	Closed reduction of fracture of ankle or toe	396		251 (63.4)			
1457	Open reduction of fracture of phalanx of hand	603			355 (58.9)		
1959	Computerised tomography of spine	611			284 (46.5)		
1517	Arthroscopic meniscectomy of knee with repair	261				74 (28.4)	
1479	Fixation of fracture of pelvis or femur	96					29 (30.2)
1489	Arthroplasty of hip	31					26 (83.9)
1430	Open reduction of fracture of ulna or olecranon	182					14 (7.7)

Note: % are of all the specified procedures applied to sport/leisure injury across all ages

Table A.11 The ten most common principal procedures for sport/leisure injuries resulting in sport/leisure injury hospitalisation of NSW for selected team ball sports in NSW, 2003–2005

ICD-10-AM procedure code	Procedure	All ages n	Sport				
			Rugby, union and league	Soccer	Australian rules football	Basketball	Netball
			n (%)	n (%)	n(%)	n (%)	n (%)
1427	Closed reduction of fracture of radius	4,946	426 (8.6)	677 (13.7)	126 (2.5)	140 (2.8)	131 (2.6)
1522	Reconstruction procedures on knee	2,033	216 (10.6)	458 (22.5)	56 (2.8)	65 (3.2)	185 (9.1)
1539	Open reduction of fracture of ankle or toe	1,638	244 (14.9)	332 (20.3)	80 (4.9)	24 (1.5)	16 (1.0)
1952	Computerised tomography of brain	1,457	245 (16.8)	99 (6.8)	55 (3.8)	24 (1.6)	15 (1.0)
1916	Generalised allied health interventions	1,149		129 (11.2)			
1542	Repair of tendon or ligament of ankle or foot	964		163 (16.9)		56 (5.8)	155 (16.1)
1429	Open reduction of fracture of radius	857	109 (12.7)			24 (2.8)	23 (2.7)
1431	Reduction of fracture of shaft of radius and ulna	820		92 (11.2)			12 (1.5)
1402	Reduction of dislocation of clavicle, scapula or shoulder	789	138 (17.5)			24 (3.0)	
1509	Closed reduction of fracture of shaft of tibia	717		223 (31.1)			
1635	Repair of wound of skin and subcutaneous tissue	682					
1454	Closed reduction of phalanx of hand	669	113 (16.9)		47 (7.0)	51 (7.6)	34 (5.1)
1365	Reduction of fracture of nasal bone	615	124 (20.2)		39 (6.3)		
1365	Reduction of fracture of nasal bone	615				26 (4.2)	
1959	Computerised tomography of spine	611	137 (22.4)				
1457	Open reduction of fracture of phalanx of hand	603			42 (7.0)	29 (4.8)	20 (3.3)
1453	Closed reduction of fracture of metacarpus of hand	411			32 (7.8)		
1456	Open reduction of fracture of metacarpus of hand	405			36 (8.9)		
1510	Open reduction of fracture of shaft of tibia	397		100 (25.2)			
1537	Closed reduction of fracture of ankle or toe	396		94 (23.7)			
1366	Reduction of fracture of mandible or maxilla	350	108 (30.9)		33 (9.4)		
1503	Arthroscopic excision of knee	342					16 (4.7)

Note: % are of all the specified procedures applied to sport/leisure injury across all ages

Table A.12 The ten most common principal procedures for sport/leisure injury hospitalisations of NSW residents for selected wheeled sports, equestrian activities, and ice and snow sports in NSW, 2003–2005

ICD-10-AM procedure code	Procedure	All ages n	Sport				
			Motorcycling	Cycling	Skating & rollerblading	Equestrian	Ice & snow
			n (%)	n (%)	n (%)	n (%)	n(%)
1427	Closed reduction of fracture of radius	4,946	150 (3.0)	258 (5.2)	579 (11.7)	137 (2.8)	75 (1.5)
1522	Reconstruction procedures on knee	2,033					337 (16.6)
1539	Open reduction of fracture of ankle or toe	1,638	69 (4.2)	33 (2.0)	64 (3.9)	32 (2.0)	45 (2.7)
1952	Computerised tomography of brain	1,457	69 (4.7)	110 (7.5)	50 (3.4)	87 (6.0)	31 (2.1)
1916	Generalised allied health interventions	1,149	88 (7.7)	61 (5.3)	29 (2.5)	93 (8.1)	40 (3.5)
1429	Open reduction of fracture of radius	857	64 (7.5)	63 (7.4)	58 (6.8)	33 (3.9)	31 (3.6)
1431	Reduction of fracture of shaft of radius and ulna	820		38 (4.6)	76 (9.3)	19 (2.3)	
1402	Reduction of dislocation of clavicle, scapula or shoulder	789			17 (2.2)		
1509	Closed reduction of fracture of shaft of tibia	717	66 (9.2)		45 (6.3)		27 (3.8)
1635	Repair of wound of skin and subcutaneous tissue	682		88 (12.9)			
1959	Computerised tomography of spine	611	49 (8.0)	33 (5.4)		55 (9.0)	
1413	Closed reduction of fracture of humerus or elbow	568				37 (6.5)	
1566	Excision procedures on other musculoskeletal sites	409	56 (13.7)	57 (13.9)			
1510	Open reduction of fracture of shaft of tibia	397	41 (10.3)				
1414	Open reduction of fracture of humerus or elbow	372			19 (5.1)	23 (6.2)	
1628	Other debridement of skin and subcutaneous tissue	301		43 (14.3)			
1486	Reduction of fracture of pelvis or femur	266	45 (16.9)				
1517	Arthroscopic meniscectomy of knee with repair	261					24 (9.2)
1963	Computerised tomography of abdomen and pelvis	253				23 (9.1)	
1401	Reduction of fracture of clavicle or shoulder	252					36 (14.3)
1415	Closed reduction of dislocation of humerus or elbow	188			17 (9.0)		
1465	Repair of ligament or capsule of phalangeal joint of hand	63					25 (39.7)

Note: % are of all the specified procedures applied to sport/leisure injury across all ages

There were no significant trends across 2003-2005 in the patterns of injury mechanisms, external causes, nature of injury, body region injured or place of injury. However, there was an indication of a possible increase in the number of dislocation/strain/sprains of the knee and fractures of the wrist/hand between 2003 and 2005. Overall, falls were the most common injury mechanism for hospitalised sport/leisure injuries, representing around 40% of all sport/leisure admissions. The most common nature of injury for hospitalised sport/leisure injuries were fractures and the most commonly injured body regions were the upper limbs, lower limbs, and head.

As the hospitalisation data and ABS participation data use different definitions of sport/leisure, the participation-based rates need to be interpreted with some caution. The ABS participation data used related to participation in organised sport or physical activity, whereas the hospitalisation data could not distinguish between formal and informal participation. This means that the numerator and denominator used in the rate calculations are not fully comparable. There is a need for a consistent definition of a sports injury to be adopted and used in NSW to aid in the standardisation of the identification of sports injuries and the calculation of robust participation-based figures.

The rates of sport/leisure injury hospitalisations in this report were calculated using both the total population and the number of participants as the denominator data. Use of the total population as the denominator in an incidence rate calculation is likely to underestimate the true risk of a hospitalised sport/leisure injury as not all of the population participates in sport/leisure activities. Using the number of participants should provide a better estimate of injury risk. However, this data is hampered by low survey sample sizes, different definitions to the hospitalised injury data and participant information not being collected for each sport¹³⁻¹⁵. At the time of writing this report, comparable participation data for children was not available and so the participation-based rates have been restricted to 15+ year olds. It is recommended that a formal assessment of participation-based injury rates be calculated for children at a future time.

As noted in previous IRMRC reports, the identification of sport/leisure injuries in hospitalisation data would be assisted by the improved coding of both the activity performed at time of incident and the place of incident coding.⁵⁶ The interested reader is referred to the report *Sports and leisure injury hospitalisations in NSW, 2003-2004: sociodemographic and geographic patterns and sport-specific profiles*⁶ for a detailed discussion of this issue and the implications for injury rates. It is likely that some injury hospitalisation cases with unspecified or missing activity codes were truly associated with sport/leisure. However, as they were not able to be identified as such, the analysis of the sport/leisure injury hospitalisation data in this report should be considered to be an underestimate of the true rate of sport/leisure injury hospitalisations in NSW.

The relatively large number of unspecified sport/leisure activity codes (including football, unspecified) suggests that the specificity of actual sport or leisure activity identified in ICD-10-AM coded data could be improved. For example, an average of 26.9% of cases were coded as *other specified sport and exercise activity or leisure activity, not elsewhere classified (U70)*, though a decline in the number of the latter did decrease over the 3-year period. This relatively high level of non-specific coding could either reflect a need to obtain further information regarding the circumstances surrounding the incident that led to the hospital admission or could represent a lack of suitable classification codes in ICD-10-AM to identify sport/leisure injuries. As there are currently 260 sport/leisure injury codes in the ICD-10-AM from which to select, the lack of suitable classification codes from which to select appears unlikely.

Particularly in relation to the football codes, the ability to be able to identify the specific type of sporting code that was being played at the time of the injury, such as the differentiation between rugby union or rugby league, is crucial in order to determine the injury incidence rates of each of these different sports⁵⁶. Over the three years of sport/leisure injury hospitalisation data examined for this report, there were 3,441 sport/leisure injury hospitalisations where the activity was coded as either other specified or unspecified football. Similarly, the distinction between different sporting settings, such as indoor or outdoor cricket, should be able to be identified in all data collections. It may be that further training related to data collection and classification or the addition of a narrative text field to

sport/leisure injury hospitalisation data could assist in the appropriate identification of particular sporting activities.

Solely using ICD-10-AM to classify sport/leisure injury hospitalisation data means that there is no scope to record specific detail regarding the type of activity performed at the time of the incident. For example, if the sporting activity was identified as cricket, no information is available regarding whether the player was batting, bowling, or fielding when the injury occurred, nor what phase of activity was being undertaken, such as training or competition. This specific type of information is often necessary to identify effective injury prevention strategies for specific sports.

This report has also provided a listing of the most common procedures received in hospital for the principal injury diagnosis for sport/leisure injury cases. As expected by the nature of the data collection, such procedures reflect the severity of hospitalised injury as evidenced by the most common being reductions of radius fractures, knee reconstructions, reductions of ankle/toe factures and CT scans of the brain. It would also appear that sport/leisure injuries account for almost 60% of all knee reconstructions for injury hospitalisations in NSW, as well as more than 40% of all repairs of ankle/foot tendons/ligaments and more than one-third of all reductions of fractures to the tibia shaft. As some injury patients admitted to hospital have more than one injury, it is likely that the actual number of such procedures for sport/leisure injury is more than that reported here. Given the relevance of data about the procedures received to health service planning, it is recommended that future research explores the full range of procedures received by hospitalised sport/leisure injury patients.

Recommendations

Given there has been no reduction in overall sport/leisure injury rates in NSW during 2003-2005, the extent to which effective sport/leisure safety programs have been developed and fully implemented in NSW needs to be determined. A strategic state-wide approach to sports safety, which includes the development of a sports policy framework involving government and non-government agencies, in conjunction with the development of safety guidelines for sports bodies to implement, needs to be adopted for the whole of NSW to reduce these rates in the future.

Rugby, soccer, cycling, Australian rules football, cricket, and motorcycle sports should be the prime focus of increased injury prevention attention in NSW because of their predominance in the sport/leisure injury hospitalisation data and/or their association with increasing injury rates over the 2003-2005 period.

Detailed routine injury surveillance systems should be developed and implemented especially for the activities with high or increasing injury rates, to continue to monitor these injury trends in specific sports. Such surveillance should be wide, across many contexts and levels of participation, to determine the extent to which such injuries are related to organised sport participation.

Consideration should be given by agencies collecting routine injury and sport participation data to develop and use consistent definitions to aid the standardisation of the identification of sports injuries and the calculation of robust participation-based injury rates.

Consideration should be given to enhancements to the ICD-10-AM coding manual that would allow the phase of play/actual activity at the time of injury to be reported (even if as a narrative) and for the type of activity to be properly differentiated between organised sport, informal sport and general play.

A formal assessment of participation-based injury rates should be undertaken for children, using the latest ABS participation data.

Reasons for the relatively high level of unspecified on non-specific ICD-10-AM activity codes for sport/leisure injury needs to be explored so that potential solutions for reducing these data inadequacies can be developed and implemented.

Given the importance of data about the medical/surgical procedures received in hospital for health service planning, it is recommended that future research quantifies the full range of procedures received by hospitalised sport/leisure injury patients, in terms of their frequency, medical cost and public health burden.

PART B. SELF-REPORTED INJURIES RELATED TO ORGANISED SPORT IN NSW

Part A of this report described trends in the rate and profile of hospitalised sport/leisure injury cases in NSW for the period 2003-2005. It is known from other Australian studies^{7 8 17 18} that hospitalisations are only the tip of the iceberg in that they only relate to the most severe sports injury cases and many sports injuries do not require hospitalisation. This means that many more sport/leisure injuries occur in NSW that are treated outside of the formal hospital setting. To get an indication of the extent to which sport/leisure injuries in NSW residents are likely to require treatment in a hospital, information about the population incidence of all sport/leisure injury is required. One potentially valuable source of population-level sport/leisure injury frequency is from large scale population health surveys, such as those conducted by NSW Health

Part B of this report therefore describes the self-reported injury experience of NSW adults aged 16+ years during organised sporting activities. Information from respondents of the 2005 NSW Population Health Survey is used to describe organised sport participation habits and the proportion of participants injured during this activity by age and sex. The responses provided about the most common sources of treatment for sport/leisure injury provide evidence for the likely underreporting of the burden of sport/leisure injury cases in NSW, which is often estimated based on hospitalisation data alone. Moreover, this information about the distribution of treatment sources is important for determining how common sport/leisure injuries are in the general community and the extent to which routine data collections, such as sport/leisure injury hospitalisations, provide coverage of all such injuries.

Data Used and Analysis

This part of the report describes the self-reported experience of injuries during organised sporting activities of individuals 16+ years in NSW, as determined from the 2005 NSW Population Health Survey¹⁹.

Overall, 13,701 respondents were sampled in the 2005 NSW Adult Health Survey conducted by NSW Health²⁰. The overall response rate was 57.7% (completed interviews divided by completed interviews and refusals). Information on organised sport participation and the subsequent occurrence of a sport/leisure injury are based on 2,414 respondents aged 16 years and over who participated in the sports-related questions in the 2005 NSW Population Health Survey¹⁰.

The full details concerning the development of the survey and the methods used are described elsewhere²⁰. A two-stage cluster sample design was used, with the sample stratified by each of the eight NSW Area Health Services (AHS). Within each AHS, households were randomly selected using a computer-generated list of telephone numbers. Respondents were then randomly selected from each household for a computer-assisted telephone interview.

Interviews were conducted continuously from February to December 2005²⁰. Households that were selected for a telephone interview that had postal addresses in the electronic phone book were sent a letter describing the aims and methods of the survey two weeks before the initial attempt at telephone contact. A 1800 free call telephone number was provided in the letter for potential respondents to verify the authenticity of the survey and to ask any questions they may have regarding the survey prior to survey commencement. Interviews were conducted by trained Health Survey Program computer assisted telephone interview (CATI) interviewers. Up to seven call backs were made to establish initial contact with a household and up to five call backs were made to contact a selected respondent. Most respondents (98.1%) were interviewed in English. During each interview, information obtained from all respondents included demographic factors such as age, gender, residence, income and

education levels; health behaviours (for example, physical activity); health status, and health service use.

Respondents who reported participating in organised sport or an activity as part of a club or association or high school whether for training, fitness or competition in the past 12 months were asked to indicate whether they had sustained an injury related to sport during the same period. Those who reported a sport/leisure injury were asked, on average, how many times they had been injured playing sport (including training) in the last 12 months and the type of medical treatment that they received as a result of their most recent injury. The questions regarding sports injury (see Appendix 4) were field tested prior to inclusion in the survey.

The analysis was undertaken using SAS statistical software, version 8.02¹⁶. The SURVEYMEANS procedure was used to analyse the data and calculate proportions of reported organised sport/leisure injury and treatment by age and/or gender. Ninety-five per cent confidence intervals (95% CI) were calculated for the estimates. A sampling weight was applied to adjust for differences in the probabilities of selection among respondents. These differences were due to the varying number of people living in each household, the number of residential telephone connections for the household, and the varying sampling fraction in each AHS.

Participation in Organised Sport

A total of 2,414 respondents aged 16+ years (25.4% of all respondents; 95% CI 24.2-26.6) stated that they had participated in organised sport or an activity as part of a club or association or high school for training, fitness or competition.

People aged 16-24 years most commonly reported participating in organised sport. Overall, more males (30.2%; 95% CI 28.3-32.1) reported organised sport participation than females (20.7%; 95% CI 19.4-22.1) (Table B.1). Participation decreased with age, especially between the 16-24 and 25-34 year age groups.

Table B.1 Percentage of individuals who participated in organised sport in the previous 12 months by age group and gender, 2005 NSW Population Health Survey

Age (years)	Males % (95% CI)	Females % (95% CI)	Persons % (95% CI)
16-24	49.3 (43.6, 54.9)	40.5 (35.4, 45.6)	44.8 (41.0, 48.7)
25-34	34.8 (29.5, 40.2)	22.1 (18.7, 25.5)	28.4 (25.2, 31.6)
35-44	29.7 (25.1, 34.2)	19.2 (16.0, 22.3)	24.4 (21.6, 27.2)
45-54	25.7 (21.8, 29.5)	15.4 (12.8, 18.0)	20.6 (18.2, 22.9)
55-64	20.5 (17.2, 23.9)	15.7 (13.4, 18.0)	18.1 (16.1, 20.1)
65+	19.3 (16.8, 21.9)	12.4 (10.7, 14.1)	15.5 (14.0, 17.0)
All ages	30.2 (28.3, 32.1)	20.7 (19.4, 22.1)	25.4 (24.2, 26.6)

Note: Estimates based on 11,273 respondents to the survey. Excludes 7 respondents whose sport participation was not stated.

On average, females reported playing around 4.0 (95% CI 3.5-4.5) hours per week of sport in the previous 12 months compared to males who reported an average of 5.3 (95% CI 4.7-6.0) hours of sport each week in the prior 12 months (Table B.2).

Table B.2 Distribution of the reported hours per week spent participating in organised sport in the previous 12 months by gender, 2005 NSW Population Health Survey

Hours of organised sport participation	Males % (95% CI)	Females % (95% CI)	Persons % (95% CI)
> 10 hours	7.1 (5.2, 9.1)	5.2 (3.5, 6.8)	6.3 (5.0, 7.7)
10 hours	3.9 (2.6, 5.3)	1.9 (0.9, 2.8)	3.1 (2.2, 4.0)
9 hours	1.6 (0.8, 2.4)	0.9 (0.4, 1.3)	1.3 (0.8, 1.8)
8 hours	6.5 (4.7, 8.3)	2.5 (1.6, 3.3)	4.8 (3.7, 5.9)
7 hours	2.0 (1.1, 3.0)	2.1 (1.1, 3.1)	2.1 (1.4, 2.8)
6 hours	9.3 (7.0, 11.5)	4.9 (3.2, 6.5)	7.4 (5.9, 8.9)
5 hours	8.2 (6.2, 10.2)	6.1 (4.3, 7.9)	7.3 (5.9, 8.7)
4 hours	13.9 (11.1, 16.8)	12.1 (9.5, 14.7)	13.2 (11.2, 15.2)
3 hours	13.5 (10.9, 16.1)	13.4 (10.8, 15.9)	13.5 (11.6, 15.3)
2 hours	17.7 (14.7, 20.7)	23.7 (20.5, 26.9)	20.2 (18.0, 22.4)
1 hour	13.6 (11.0, 16.2)	24.1 (20.7, 27.5)	18.0 (15.9, 20.1)
Nil hours	2.6 (1.6, 3.7)	3.3 (2.2, 4.5)	2.9 (2.1, 3.7)

Note: Estimates based on 2,357 respondents who said they participated in organised sport. Excludes 57 respondents with unstated hours per week of sport participation.

Proportion of Injured Organised Sport Participants

Of the 2,414 respondents who indicated that they had participated in organised sport in the last 12 months, 538 (30.9%; 95% CI 28.2-33.6) stated that they had been injured playing sport (including training) (Table B.3). There were clear relationships between age and injury for females with younger females being more likely to report injury. For males there was also an age relationship, but there was less decline in the percentage of reported injury in the 25-54 year age group. In ages from 55 years onwards, males and females showed the same decline in the percentage injured. Forty (1.7%) respondents did not state their injury status (i.e. not known or refused). A majority of respondents (69.1%; 95% CI 66.4-71.8) reported that they had not sustained an injury while playing sport in the last 12 months (Table B.4).

Table B.3 Frequency of reported injury amongst those who played organised sport in the previous 12 months by age group and gender, 2005 NSW Population Health Survey

Age-group	Males % (95% CI)	Females % (95% CI)	Persons % (95% CI)
16-24	51.1 (42.9, 59.30)	34.7 (26.9, 42.4)	43.5 (37.7, 49.20)
25-34	42.3 (32.9, 51.80)	29.8 (21.9, 37.8)	37.4 (30.8, 44.0)
35-44	34.5 (25.7, 43.3)	23.7 (15.8, 31.5)	30.3 (24.1, 36.6)
45-54	34.5 (25.6, 43.3)	18.3 (10.6, 26.0)	28.4 (22.0, 34.8)
55-64	13.6 (7.3, 19.8)	10.8 (5.4, 16.2)	12.4 (8.1, 16.6)
65+	5.1 (2.0, 8.30)	1.4 (0.1, 2.7)	3.5 (1.6, 5.40)
All ages	35.8 (32.0, 39.6)	24.1 (20.7, 27.5)	30.9 (28.2, 33.6)

Note: Estimates based on 2,374 respondents who said they played organised sport. Excludes 40 respondents whose injury status was not stated.

Table B.4 Distribution of the number of injuries sustained by those who played organised sport in the previous 12 months by gender, 2005 NSW Population Health Survey

Number if injuries sustained during organised sport	Males % (95% CI)	Females % (95% CI)	Persons % (95% CI)
> 5 injuries	3.2 (1.7, 4.7)	1.7 (0.5, 2.90)	2.5 (1.5, 3.600)
5 injuries	0.8 (0.1, 1.6)	1.2 (0.1, 2.3)	1 (0.4, 1.6)
4 injuries	1.9 (0.8, 2.90)	0.7 (0.1, 1.2)	1.4 (0.7, 2.0)
3 injuries	4.3 (2.5, 6.1)	2.5 (1.2, 3.7)	3.5 (2.3, 4.7)
2 injuries	10.3 (7.8, 12.70)	6.8 (4.6, 9.0)	8.8 (7.1, 10.5)
1 injury	15.3 (12.5, 18.2)	11.2 (8.9, 13.6)	13.6 (11.7, 15.6)
No injuries	64.2 (60.4, 68.0)	75.9 (72.5, 79.3)	69.1 (66.4, 71.8)

Note: Estimates based on 2,374 respondents who said they played organised sport. Excludes 40 respondents where the number of injuries sustained was not stated.

Treatment for most recent injury

Of the 538 respondents who stated that they were injured playing organised sport in the previous 12 months, 16.4% (95%CI 12.3-20.6) did not receive any treatment for their most recent injury. One-third (33.9%; 95%CI 28.8-39.0) self-treated their injury or were treated by a partner, parent or friend; around one-quarter (26.6%; 95%CI 21.8-31.4) received treatment from a physiotherapist and 15.6% (95%CI 11.9-19.4) of injured respondents received treatment from a general practitioner, family doctor or sports doctor (Table B.5). Only 2.8% (95%CI 1.2-4.4) of organised sport/leisure injures were reported to require admission to hospital and 6.1% (95%CI 3.5-8.7) were reported to involve a presentation to an emergency department.

Table B.5 Proportion of injured individuals injured playing organised sport in the last 12 months by treatment type and gender, 2005 NSW Population Health Survey

Source of treatment	Males % (95% CI)	Females % (95% CI)	Persons % (95% CI)
Treated self	33.9 (27.5, 40.4)	33.8 (25.8, 41.7)	33.9 (28.8, 39.00)
Physiotherapist	24.7 (18.7, 30.70)	30.5 (22.5, 38.4)	26.6 (21.8, 31.4)
No treatment	18.0 (12.4, 23.5)	13.3 (8.1, 18.5)	16.4 (12.3, 20.6)
General practitioner	16.1 (11.3, 21.0)	14.6 (8.7, 20.4)	15.6 (11.9, 19.4)
Chiropractor, osteopath or acupuncturist	5.1 (1.7, 8.4)	10.3 (5.2, 15.5)	6.8 (4.0, 9.6)
Emergency department	7.0 (3.5, 10.6)	4.2 (1.3, 7.2)	6.1 (3.5, 8.7)
Masseur	4.0 (0.9, 7.2)	3.5 (0.8, 6.2)	3.9 (1.5, 6.2)
Admitted to hospital	3.5 (1.2, 5.8)	1.4 (0.1, 2.7)	2.8 (1.2, 4.4)
Sports trainer	2.0 (0.0, 4.2)	0.4 (0.0, 1.1)	1.5 (0.0, 3.00)
Dentist or orthodontist	0.4 (0.0, 0.9)	0.0 (0.0, 0.0)	0.3 (0.0, 0.6)
Naturopath or alternative health practitioner	0.2 (0.0, 0.5)	0.8 (0.0, 2.0)	0.4 (0.0, 0.8)
Other	0.2 (0.0, 0.5)	0.2 (0.0, 0.05)	0.2 (0.0, 0.4)

Note: Estimates based on 534 respondents who said they played organised sport and sustained an injury. Excludes 40 respondents whose type of treatment was not stated. Respondents could indicate more than one response, so percentage will total more than 100 per cent.

Implications

This analysis of the 2005 NSW Population Health Survey described population-level participation in organised sport and associated injuries that occurred in the course of this participation for a population-representative sample of NSW adults. Males both participated more in organised sport and were injured during such activity more frequently than females. The proportion of individuals who stated that they participated in organised sport in the last 12 months declined steadily as age increased.

Almost one-in four adults who participated in organised sport in the previous 12 months reported being injured during this sport participation, highlighting the frequency with which such injuries occur. Most of these injuries were minor, however with about 50% of cases either self-treating or receiving no treatment for their injuries. Hospitalisation for an organised sport injury was not common, with under 3% of injured organised sport participants reporting this level of care. A further 6% of injured organised sport participants received treatment at an emergency department, indicating a relatively large proportion of injuries that are not included in usual estimates of the burden of sport/leisure injuries based on routinely collected health sector data in NSW. More than half of the people with self-reported injuries had sustained two or more injuries during organised sport participation in the previous 12 months.

A limitation of the 2005 NSW Population Health Survey was that it did not ask about the type of sport played at the time of the most recent injury and so specific sport injury priorities cannot be determined from this data.

In future, information from the NSW Population Health Survey would be improved by the inclusion of additional sport/leisure questions, such as the type of sport played at the time of injury, the type of injury sustained, and the time taken off work, school or daily activities as a result of a sport/leisure injury. These questions were successfully pilot tested by the NSW Population Health Survey program and the feasibility of including them into the next edition of the NSW Population Health Survey should be considered. This additional information would be useful as it would allow both the type of sport played at the time of the injury and the type of injury to be identified, and would also provide a proxy measure of the impact of the injury on the individual's daily life. In addition, obtaining information regarding the experience of sport/leisure injuries of children aged 15 years or less should be considered for the next NSW Child Health Survey as young children, particularly those aged 10-14 years, represent the highest rate of hospitalised sport/leisure injuries in NSW.

Recommendations

Given that almost one-in four adults who participated in organised sport over a 12 month period injure themselves whilst undertaking this activity, and about half of these require some form of treatment, sports injury prevention should receive priority attention in both injury prevention and physical activity promotion activities in NSW.

Males should be a particular focus of sports prevention efforts, given the higher proportion of them self-reporting injury during organised sport participation, across all age groups from 16 years onwards.

Solely using sport/leisure injury data from the NSW APDC to estimate the burden of sport/leisure injury in NSW underestimates the public health burden associated with sport/leisure injury in this State. Consideration should be given to assessing the feasibility of enhancing or establishing new routinely collected data collections to describe the burden of sport/leisure injuries on health service delivery and individuals. Different models for sport/leisure injury surveillance within various health

care settings that commonly treat sport/leisure injuries such as emergency departments, physiotherapist practices and general practitioners, in particular, should be explored.

Future NSW Population Health Survey questions about sport injury would be improved by the inclusion of additional questions requesting information about the type of sport played at the time of injury, the type of injury sustained, and the time taken off work, school or daily activities as a result of a sport/leisure injury.

REFERENCES

1. Poulos R, Donaldson A, Elkington J, C F. Understanding the barriers and bridges to the development and implementation of evidence-informed sports injury prevention policy in NSW. A report for the NSW Sporting Injuries Committee. Sydney: University of New South Wales, 2008.
2. Australian Bureau of Statistics. Sport and Recreation: A Statistical Overview, Australia, 2007 (Edition 1). Catalogue no. 4156.0. Canberra Australian Bureau of Statistics, 2007.
3. Warburton D, Nicol C, Bredin S. Health benefits of physical activity: the evidence. *Canadian Medical Association Journal* 2006; 174(6):801-809.
4. Finch CF, Owen N. Injury prevention and promoting physical activity: what is the nexus? *Journal of Science and Medicine in Sport* 2001; 4: 77-87.
5. Boufous S, Dennis R, Finch C. A profile of hospitalisations and deaths due to sport and leisure injuries in New South Wales, 2000-2004. Sydney, Australia: NSW Injury Risk Management Research Centre, 2006. Available from www.irmrc.unsw.edu.au.
6. Finch C, Boufous S, Dennis R. Sports and leisure injury hospitalisations in NSW, 2003-2004: sociodemographic and geographic patterns and sport-specific profiles: NSW Injury Risk Management Research Centre, 2007. Available from www.irmrc.unsw.edu.au.
7. Cassell E, Finch C, Stathakis V. The epidemiology of medically-treated sport and active recreation injuries in the Latrobe Valley, Victoria. *British Journal of Sports Medicine* 2003; 37.:405-409.
8. Finch C, Cassell E. The public health impact of injury during sport and active recreation. *Journal of Science & Medicine in Sport* 2006;9: 490-497.
9. Potter Forbes M, Atkin C. Injury costs!A valuation of the burden of injury in New South Wales 1998-1999: NSW Injury Risk Management Research Centre, University of New South Wales, Sydney, 2003.
10. Centre for Epidemiology and Research. Health Outcomes and Information Statistical Toolkit (HOIST). Inpatient Statistics Collection. Sydney: Australia: NSW Department of Health, 2006.
11. National Centre for Classification in Health. The International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10-AM). 3rd Edition: Sydney: National Centre for Classification in Health, 2002.
12. Finch C, Valuri G, Ozanne-Smith J. Sport and active recreation injuries in Australia: evidence from emergency department presentations. *British Journal of Sports Medicine* 1998;32:220-225.
13. Standing Committee on Recreation and Sport. Participation in exercise, recreation and sport annual report 2003, from <http://www.ausport.gov.au/scorsresearch/erass2003.asp>, 2004.
14. Standing Committee on Recreation and Sport. Participation in exercise, recreation and sport annual report 2004, from <http://www.ausport.gov.au/fulltext/2005/scors/ERASS2004.pdf>, 2005.
15. Standing Committee on Recreation and Sport. Participation in exercise, recreation and sport annual report 2005, from <http://www.ausport.gov.au/scorsresearch/erass2005.asp>, 2006.
16. SAS Institute. *SAS: statistical software. Version 8.02*. Cary (NC): SAS Institute Inc 2000.
17. Lower T. Sport injury patterns in urban and rural accident and emergency units. *Australian Journal of Rural Health* 1996; 4:28-32.
18. Mummery W, Schofield G, Spence J. The epidemiology of medically attended sport and recreational injuries in Queensland. *Journal of Science and Medicine in Sport* 2002;5(4):307-320.
19. Centre for Epidemiology and Research. New South Wales Population Health Survey 2005 (HOIST). Sydney: NSW Department of Health, 2005.

20. Centre for Epidemiology and Research. 2005 Report on Adult Health from the New South Wales Population Health Survey. Sydney: NSW Department of Health, 2006: Available online at www.health.nsw.gov.au/publichealth/surveys/index.asp.

APPENDIX 1

ICD-10-AM SPORT/LEISURE ACTIVITY CODES

Reproduced with permission from the National Centre for Classification in Health.

ACTIVITY (U50–U73)

Note: Codes from this section are for use with categories V01–Y34 to identify the activity of the injured person at the time the event occurred.

These categories should not be confused with, or be used instead of, category Y92 Place of occurrence, which is provided to indicate the place of occurrence of the event at the time the person was injured.

When multiple codes apply, assign the code appearing highest in the tabular list. For example, cases where sport is undertaken during school or as part of paid work should be assigned the activity code for sport (U50–U71).

Sport and leisure (U50–U72)

Codes within U50–U71 for sporting activities have been derived from the International Classification of External Causes of Injury (ICECI) Version 1.0. They enable the circumstances of sports injury to be better identified and thus aid prevention strategies.

'Sport' overlaps with 'leisure' and sufficiently specific and generally accepted definitions for these activities, suitable for use in clinical coding, are not available. Most of the activities specified by codes U50–U71 are commonly recognised as sports, though they may also be engaged in as leisure. Residual categories have also been created for those sporting activities that cannot be classified to the more specific categories. U72 Leisure activity, not elsewhere classified is provided to enable coding of other leisure activities, not identified as sport.

When both a sports (U50–U71) and leisure (U72) code apply, assign the activity code for sport.

The aggregation of data on sporting activities can be adapted according to the needs of data users by selection of those particular sporting activities of interest. For example, if school-related recreational activities were not considered to be 'sport' for a particular purpose, codes within category U69 Other school-related recreational activities could be omitted from the set of data considered.

Other activity (U73)

This category includes codes for working for income according to industry type which are of particular importance for occupational safety. The codes within category U73.0 While working for income are derived from the ABS Australian and New Zealand Standard Industrial Classification (ANZSIC).

Other activities classified within this category include other types of work (U73.1) and vital activities such as resting, sleeping or eating (U73.2).

WHILE ENGAGED IN SPORTS OR LEISURE (U50–U72)

- U50** Team ball sports
- U50.0 Football
 - U50.00 Australian Rules
 - U50.01 Rugby Union
 - U50.02 Rugby League
 - U50.03 Rugby, unspecified
 - U50.04 Soccer
 - U50.05 Touch football
 - American touch or flag
 - Touch rugby
 - U50.08 Other specified football
 - American tackle
 - Gaelic
 - Gridiron
 - U50.09 Football, unspecified
 - U50.1 Basketball
 - U50.2 Handball, team
- U50.3** Netball
 - U50.30 Indoor
 - 6 player
 - Excludes:* traditional netball played indoors (U50.39)
 - U50.39 Netball, other and unspecified
 - Netball NOS
- U50.4 Korfball
- U50.5 Volleyball
 - Volleyball (2, 4 or 6 player):
 - beach
 - indoor
 - outdoor
- U50.8 Other specified team ball sport
- U50.9 Unspecified team ball sport
- U51** Team bat or stick sports
 - U51.0 Baseball
 - U51.1 Cricket

U51.2 Hockey

- U51.20 Ice
Ice hockey:
 - indoor
 - outdoor
- U51.21 Street and ball
Outdoor hockey played on in-line or roller skates
- U51.22 Field
Outdoor hockey played on turf or grass
- U51.23 Floor
Indoor hockey played on hard surface with or without in-line or roller skates
- U51.28 Other specified hockey
Underwater hockey
- U51.29 Hockey, unspecified
- U51.3 Softball
- U51.4 T-ball
- U51.8 Other specified team bat or stick sport
Lacrosse
- U51.9 Unspecified team bat or stick sport

U52 Team water sports

Excludes: competitive and recreational swimming (U54.5-) individual water sports (U54.-)

- U52.0 Synchronised swimming
- U52.1 Water polo
- U52.8 Other specified team water sport
- U52.9 Unspecified team water sport

U53 Boating sports

- U53.0 Canoeing
- U53.1 Jet skiing
- U53.2 Kayaking
- U53.3 Power boat racing
Jet boat racing
- U53.4 Rowing and sculling
- U53.5 Surf boating
- U53.6 Yachting and sailing

- U53.7 Surf skiing
- U53.8 Other specified boating sport
- U53.9 Unspecified boating sport
Recreational boating NOS

U54 Individual water sports**U54.0 Diving**

Excludes: scuba diving (U54.2)

- U54.00 Cliff
- U54.01 Springboard
- U54.02 Platform
- U54.08 Other specified diving
- U54.09 Diving, unspecified

U54.1 Fishing

- U54.10 Rock fishing
- U54.18 Other specified fishing
Ice fishing
Spear fishing
- U54.19 Fishing, unspecified
- U54.2 Scuba diving
- U54.3 Snorkelling
- U54.4 Surfing and boogie boarding
Excludes: wind surfing (U54.7)

U54.5 Swimming

- U54.50 Competitive
- U54.51 Recreational
- U54.59 Swimming, unspecified
- U54.6 Water skiing
Wake boarding
Water ski jumping
- U54.7 Wind surfing
Excludes: surfing and boogie boarding (U54.4)
- U54.8 Other specified individual water sport
Water:
 - sliding
 - tubing
- U54.9 Unspecified individual water sport

U55**Ice and snow sports**

- U55.0 Bobsledding
Luge
- U55.1 Ice skating and ice dancing
Figure skating
Excludes: ice hockey (U51.20)
speed skating (U55.5)
- U55.2 Skiing
- U55.20 Alpine and downhill
- U55.21 Nordic and cross country
- U55.22 Freestyle
- U55.23 Snow ski jumping
Aerials
- U55.28 Other specified skiing
- U55.29 Skiing, unspecified
- U55.3 Snowmobiling
- U55.4 Snow boarding
- U55.5 Speed skating
Excludes: ice hockey (U51.20)
ice skating and ice dancing (U55.1)
- U55.6 Tobogganing
- U55.7 Curling
- U55.8 Other specified ice or snow sport
- U55.9 Unspecified ice or snow sport

U56**Individual athletic activities**

- U56.0 Aerobics and calisthenics
- U56.00 Aerobics
Aquarobics
Boxercise
High impact
Low impact
Pump
Sculpture
Step
Taibo
} aerobics
- U56.01 Calisthenics

- U56.1 Jogging and running
Excludes: running (in):
• marathon (U56.5)
• track and field events (U56.3-)
- U56.2 Walking
Walking (power), non competitive
Excludes: walking (in), track and field events
(U56.4)
- U56.3 Track and field
Excludes: track and field events in multidiscipline
events (U67.-)
- U56.30 Racing over obstacles and hurdles
100, 110 and 400 metre hurdles
Steeplechase
- U56.31 Sprinting and middle distance
100, 200, 400, 800 and 1500 metre races (relays)
Excludes: racing over hurdles (U56.30)
- U56.32 Running long distances
Includes: 5000 and 10000 metre races
cross-country races
Excludes: marathon running (U56.5)
- U56.33 High jump
- U56.34 Long jump
- U56.35 Pole vault
- U56.36 Triple jump
- U56.37 Throwing events
Discus
Hammer
Javelin
Shot put
} throw
- U56.38 Other specified track and field
- U56.39 Track and field, unspecified
- U56.4 Walking
Competitive walking (in) track and field event
- U56.5 Marathon running
Ultramarathon
- U56.8 Other specified individual athletic activity
Tai Chi
Yoga
- U56.9 Unspecified individual athletic activity

U57 Acrobatic sports

U57.0 Gymnastics

- U57.00 Balance beam
- U57.01 Floor
 - Floor exercise and tumbling
 - Rhythmic gymnastics (with props)
- U57.02 High bar
 - Uneven parallel bars
- U57.03 Parallel bars
- U57.04 Rings
- U57.05 Side horse and pommel horse
- U57.06 Trampoline and mini-trampoline
- U57.07 Vault
- U57.08 Other specified gymnastics
- U57.09 Gymnastics, unspecified
- U57.8 Other specified acrobatic sport
- U57.9 Unspecified acrobatic sport

U58 Aesthetic activities

- U58.0 Dancing
- U58.8 Other specified aesthetic sport
 - Marching
- U58.9 Unspecified aesthetic sport

U59 Racquet sports

- U59.0 Badminton
- U59.1 Racquetball
- U59.2 Squash
- U59.3 Table tennis and Ping-Pong
- U59.4 Tennis
 - Clay
 - Grass
 - Hard } court tennis
- U59.8 Other specified racquet sport
- U59.9 Unspecified racquet sport

U60 Target and precision sports

- U60.0 Archery
- U60.1 Billiards, pool and snooker
- U60.2** Bowling
 - U60.20 Lawn bowling
 - U60.21 Tenpin bowling
 - U60.22 Indoor bowling
 - Excludes:* tenpin bowling (U60.21)
 - U60.29 Bowling, other and unspecified
- U60.3 Croquet
- U60.4 Darts
- U60.5 Golf
- U60.6 Firearm shooting
 - Clay
 - Field
 - Pigeon
 - Running game
 - Skeet } shooting
- U60.8 Other specified target and precision sport
 - Bocce
 - Boules
 - Petanque

- U60.9 Unspecified target and precision sports

U61 Combative sports

- U61.0 Aikido
- U61.1 Boxing
- U61.2 Fencing
 - Excludes:* in modern pentathlon (U67.3)

U61.3 Martial arts

- U61.30 Judo
- U61.31 Jujitsu
- U61.32 Karate
- U61.33 Kendo
- U61.34 Kick-boxing
- U61.35 Kung fu

- ⊕U61.36 Tae kwon do
- ⊕U61.38 Other specified martial arts
- ⊕U61.39 Martial arts, unspecified
- ⊕U61.4 **Wrestling**
- ⊕U61.40 Freestyle
- ⊕U61.41 Greco-Roman
- ⊕U61.42 Professional
- ⊕U61.48 Other specified wrestling
- ⊕U61.49 Wrestling, unspecified
- ⊕U61.5 Self defence training
- ⊕U61.8 Other specified combative sport
- ⊕U61.9 Unspecified combative sport

⊕U62 **Power sports**

- ⊕U62.0 Power lifting
 - Bench press
 - Deadlift
 - Squat
- ⊕U62.1 Weight lifting
 - Competition and noncompetition:
 - Clean-and-Jerk
 - Snatch
- ⊕U62.3 Strength training and body building
- ⊕U62.4 Wood chopping
- ⊕U62.5 Wood sawing
- ⊕U62.8 Other specified power sport
- ⊕U62.9 Unspecified power sport

⊕U63 **Equestrian activities**

Excludes: in modern pentathlon (U67.3)

- ⊕U63.0 Equestrian events
 - ⊕U63.01 Dressage
 - ⊕U63.02 Show jumping
 - ⊕U63.03 Steeplechase
 - ⊕U63.08 Other specified equestrian event
 - ⊕U63.09 Equestrian event, unspecified

- ⊕U63.1 Endurance riding
 - Cross-country riding
- ⊕U63.2 Polo and polocrosse
- ⊕U63.3 Horse racing
 - Excludes:* trotting and harness racing (U63.6)
- ⊕U63.4 Rodeo
- ⊕U63.5 Trail or general horseback riding
- ⊕U63.6 Trotting and harness
- ⊕U63.8 Other specified equestrian activity
- ⊕U63.9 Unspecified equestrian activity

⊕U64 **Adventure sports**

- ⊕U64.0 Abseiling and rappelling
- ⊕U64.1 Hiking
 - Tramping
- ⊕U64.2 Mountaineering
- ⊕U64.3 Orienteering and rogaining
- ⊕U64.4 River rafting
- ⊕U64.5 White-water rafting
- ⊕U64.6 Rock climbing
- ⊕U64.7 Bungy jumping
- ⊕U64.8 Other specified adventure sport
- ⊕U64.9 Unspecified adventure sport

⊕U65 **Wheeled motor sports**

- ⊕U65.0 Riding an all-terrain vehicle (ATV)
 - Three- and four-wheeled ATVs
- ⊕U65.1 Motorcycling
 - Dirt bike racing and jumping
 - Motocross
- ⊕U65.2 Motor car racing
 - Rallying
 - Speedway
- ⊕U65.3 Go-carting
 - Carting
- ⊕U65.8 Other specified motor sport
- ⊕U65.9 Unspecified motor sport

U66**Wheeled non-motored sports****U66.0****Cycling***Excludes:* in triathlon (U67.4)**U66.00****BMX**BMX jumping
Trick and stunt bikes**U66.01****Mountain****U66.02****Road****U66.03****Track and velodrome****U66.08****Other specified cycling****U66.09**Cycling, unspecified
Recreational cycling NOS**U66.1****In-line skating and rollerblading****U66.2****Roller skating****U66.3****Skate boarding****U66.4****Scooter riding****U66.40****Folding non-motored scooter****U66.49**Other and unspecified non-motored scooter
Scooter riding NOS**U66.8**Other specified wheeled non-motored sport
Street luge**U66.9****Unspecified wheeled non-motored sport****U67****Multidiscipline sports****U67.0****Biathlon, winter***Includes:* cross-country skiing } event(s)
shooting*Excludes:* summer biathlon (U67.8)**U67.1****Decathlon***Includes:* 100, 400 and 1500 metre } event(s)
110 metre hurdles
discus throw
high jump
javelin throw
long jump
pole vault
shot put**U67.2****Heptathlon***Includes:* 100 metre hurdles } event(s)
200 and 800 metre
high jump
javelin throw
long jump
pole vault
shot put**U67.3****Modern Pentathlon***Includes:* equestrian } event(s)
fencing
running
shooting
swimming**U67.4****Triathlon****U67.40****Cycling event****U67.41****Running event****U67.42****Swimming event****U67.49****Unspecified event****U67.8**Other specified multidiscipline sport
Summer biathlon**U67.9****Unspecified multidiscipline sport****U68****Aero sports****U68.1****Aerobatics****U68.2****Gliding****U68.3****Hang gliding****U68.4**Parachuting and sky diving
BASE jumping
Sky surfing**U68.5**Paragliding and parasailing
Parapenting**U68.6****Hot air ballooning****U68.8****Other specified aero sport****U68.9****Unspecified aero sport****U69****Other school-related recreational activities****U69.0****School physical education class****U69.1**School free play
Activities during recess**U69.8**

Other specified school-related recreational activity

U69.9

Unspecified school-related recreational activity

U70

Other specified sport and exercise activity

U70.0 Athletic activities involving fitness equipment, not elsewhere classified

Includes: dumbbell
StairMaster
stationary pedal cycle
treadmill

Excludes: strength training and body building (U62.3)

U70.8 Other specified sport and exercise activity

U71

Unspecified sport and exercise activity

U72

Leisure activity, not elsewhere classified

Hobby activities

Participation in sessions and activities of voluntary organisations

Includes: leisure-time activities with an entertainment element such as going to the cinema, to a dance or to a party

APPENDIX 2

PARTICIPATION IN SPORT AND RECREATIONAL ACTIVITIES DATA FROM ERASS

The Exercise, Recreation and Sport Survey (ERASS) is a joint initiative of the Australian Sports Commission and the state and territory agencies responsible for sport and recreation. The following participation data for NSW and associated information are reproduced with permission.

Participation figures used in this report were based on the following ERASS questions: The following questions are about physical activities you have participated in during the last 12 months for exercise, recreation or sport. Do not include any activities that were part of work or household and garden chores.

Q1 During the last 12 months did you participate in any physical activities for exercise, recreation or sport?

- Yes.....1 Go to Q2
 No.....2 Go to Q6
 Don't know.....9 Go to Q6

Q2 What activities did you participate in?

Up to maximum of 10 activities to be coded

Participation in sport and recreational activities in NSW, 2003–2005 ¹

Age group (years)	Males	Females	Persons
15-24	1,295,200	1,228,300	2,523,500
25-34	1,292,700	1,233,700	2,526,400
34-44	1,244,100	1,227,600	2,471,700
45-54	1,095,100	1,084,900	2,180,000
55-64	814,200	795,000	1,609,200
65 and over	783,800	907,100	1,690,800
Total	6,525,000	6,476,600	13,001,600

Participation in selected sports and physical activities in NSW, 2003–2005^{1,2}

Sport/leisure activity	2003			2004			2005		
	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons
Football, rugby (League, Union)	118,100	18,700	136,800	153,100	13,500	166,600	193,800	4,600	198,400
Football, Australian Rules	45,900	6,600	52,500	39,000	4,000	43,100	29,500	4,900	34,400
Football, soccer (indoor and outdoor)	288,300	82,500	370,800	304,900	92,400	418,400	N/A	N/A	N/A
Netball	9,800	138,500	148,300	14,200	138,500	152,700	27,000	141,400	168,300
Cricket (indoor and outdoor)	164,900	23,700	188,600	197,000	21,900	218,900	145,500	17,400	162,900
Basketball	119,400	51,700	171,100	85,400	52,200	137,600	103,900	48,500	152,400
Hockey (outdoor)	15,400	25,500	40,800	29,200	35,400	64,600	8,700	23,900	32,600
Racquet sports (tennis, squash other racquet sports)	368,500	254,600	623,100	398,500	275,600	674,100	317,600	270,700	588,200
Ice and snow sports	62,400	25,600	88,000	79,600	54,300	133,900	61,800	33,900	95,700
Individual athletic activities ³	1,469,100	2,010,100	3,479,200	1,446,100	2,155,400	3,601,500	1,465,500	2,227,200	3,692,700
Acrobatic sports	N/A	N/A	N/A	3,600	14,700	18,300	2,100	20,800	22,900
Target and precision sports ⁴	470,400	167,800	638,200	539,300	168,900	708,300	420,900	174,700	595,600
Equestrian sports	20,500	26,300	46,800	11,600	55,300	66,900	25,900	46,000	71,900
Motor sports (motor cycle and other wheeled motor sports)	43,600	3,300	46,900	70,000	2,700	72,700	49,700	6,900	56,600
Swimming	431,600	483,900	915,600	470,500	491,300	961,800	404,800	466,900	871,700
Surfing and boogie. boarding	133,800	15,900	149,700	192,700	39,500	232,300	153,000	23,300	176,300
Cycling	294,900	109,400	404,300	324,100	157,600	481,700	325,400	148,900	474,200
Skating and rollerblading (roller sports)	25,000	7,200	32,200	17,400	15,200	32,700	25,000	3,200	28,200

¹Adapted from the Participation and Exercise, Recreation and Sport Annual Reports, 2003 to 2005.

²Excluded in 2003 were badminton from racquet sports, acrobatic sports, and carpet bowls from target and precision sports. Soccer was excluded in 2005.

³Individual athletic activities includes: bushwalking, other walking, running, aerobics, triathlon, and track and field.

⁴Target and precision sports includes: darts, shooting sports, golf, carpet bowls, lawn bowls and tenpin bowling.

APPENDIX 3
COMMON PRINCIPAL PROCEDURES GIVEN TO SPORT/LEISURE INJURY
HOSPITALISATION CASES NSW-BASED HOSPITALISATIONS OF NSW
RESIDENTS, 2003–2005

ICD-10-AM procedure code	Procedure	n	%
1427	Closed reduction of fracture of radius	4,946	12.8
1522	Reconstruction procedures on knee	2,033	5.3
1539	Open reduction of fracture of ankle or toe	1,638	4.2
1952	Computerised tomography of brain	1,457	3.8
1916	Generalised allied health interventions	1,149	3.0
1542	Repair of tendon or ligament of ankle or foot	964	2.5
1429	Open reduction of fracture of radius	857	2.2
1431	Reduction of fracture of shaft of radius and ulna	820	2.1
1402	Reduction of dislocation of clavicle, scapula or shoulder	789	2.0
1509	Closed reduction of fracture of shaft of tibia	717	1.9
1635	Repair of wound of skin and subcutaneous tissue	682	1.8
1454	Closed reduction of phalanx of hand	669	1.7
1365	Reduction of fracture of nasal bone	615	1.6
1959	Computerised tomography of spine	611	1.6
1457	Open reduction of fracture of phalanx of hand	603	1.6
1413	Closed reduction of fracture of humerus or elbow	568	1.5
1453	Closed reduction of fracture of metacarpus of hand	411	1.1
1566	Excision procedures on other musculoskeletal sites	409	1.1
1456	Open reduction of fracture of metacarpus of hand	405	1.1
1510	Open reduction of fracture of shaft of tibia	397	1.0
1537	Closed reduction of fracture of ankle or toe	396	1.0
1414	Open reduction of fracture of humerus or elbow	372	1.0
1366	Reduction of fracture of mandible or maxilla	350	0.9
1503	Arthroscopic excision of knee	342	0.9
1628	Other debridement of skin and subcutaneous tissue	301	0.8

ICD-10-AM procedure code	Procedure	n	%
1486	Reduction of fracture of pelvis or femur	266	0.7
1517	Arthroscopic meniscectomy of knee with repair	261	0.7
1963	Computerised tomography of abdomen and pelvis	253	0.7
1401	Reduction of fracture of clavicle or shoulder	252	0.7
1554	Other application, insertion or removal procedures on other musculoskeletal sites	225	0.6
1508	Open reduction of fracture of tibial plateau	213	0.6
1368	Reduction of fracture of zygomatic bone	209	0.5
1962	Computerised tomography of abdomen	196	0.5
1415	Closed reduction of dislocation of humerus or elbow	188	0.5
2015	Magnetic resonance imaging	185	0.5
1430	Open reduction of fracture of ulna or olecranon	182	0.5
1572	Other repair procedures on tendon of other musculoskeletal sites	178	0.5
1965	Computerised tomography of limb	178	0.5
1404	Other repair procedures on shoulder	170	0.4
1458	Closed reduction of dislocation of joint of hand	169	0.4
1466	Repair of tendon of hand	152	0.4
1538		143	0.4
1956	Open reduction of fracture of calcaneum, talus or metatarsus	142	0.4
406	Computerised tomography of facial bone and/or paranasal sinus (and brain)	141	0.4
1428	Other repair procedures on mouth, palate or uvula	138	0.4
1455	Closed reduction of fracture of ulna or olecranon	138	0.4
1470	Open reduction of fracture of carpus	118	0.3
1870	Interventions involving assistive or adaptive device, aid or equipment	116	0.3
1636	Repair of nail	113	0.3
560	Application, insertion or removal procedures on chest wall, mediastinum or diaphragm	108	0.3
1520	Other repair procedures on knee or leg	102	0.3
1605	Removal of foreign body from skin and subcutaneous tissue with incision	98	0.3
1479	Fixation of fracture of pelvis or femur	96	0.2
1716	Reconstruction of orbital cavity	96	0.2
1500	Internal fixation of fracture of femoral condyle	95	0.2
1501	Other incision procedures on knee	92	0.2
1459	Open reduction of dislocation of joint of hand	81	0.2

ICD-10-AM procedure code	Procedure	n	%
83	Repair of nerve or nerve trunk	75	0.2
1495	Immobilisation of fracture of fibula, patella or tibia	75	0.2
1507	Closed reduction of fracture of tibial plateau	75	0.2
1506	Reduction of dislocation of knee or patella	74	0.2
1606	Incision and drainage of skin and subcutaneous tissue	67	0.2
236	Other repair procedures on eyelid	65	0.2
1405	Reconstruction procedures on shoulder	64	0.2
1465	Repair of ligament or capsule of phalangeal joint of hand	63	0.2
569	Continuous ventilatory support	62	0.2
1487	Reduction of dislocation of hip	62	0.2
1540	Closed reduction of dislocation of ankle or foot	58	0.2
	Other procedures	2,311	6.0
	Missing/no procedure	8,049	20.9
	Total	38,557	100.0

APPENDIX 4
SPORTS INJURY QUESTIONS FROM THE NSW POPULATION
HEALTH SURVEY PROGRAM

Q1. In the last 12 months have you participated in organised sport or activity as part of a club or association or high school, whether for training, fitness or competition? Please do not include recreational walking.

- 1. Yes
- 2. No → END OF MODULE
- X Don't know → END OF MODULE
- R Refused → END OF MODULE

Q2. In the last 12 months, on average, how many hours per week did you spend playing sport (including training)?

- 1. [SPECIFY HOURS] _____
- X Don't know
- R Refused

Q3. In the last 12 months, on average, how many times have you been injured playing sport (including training)?

- 1. [SPECIFY TIMES] _____
- X Don't know
- R Refused

Q4. What treatment did you receive as a result of your most recent injury?

- 1. None
- 2. Treated self (including treated by partner, parent, or friend)
- 3. Sports trainer
- 4. Emergency department presentation
- 5. Hospital admission
- 6. General practitioner, family doctor, or sports doctor
- 7. Physiotherapist
- 8. Chiropractor, osteopath, or acupuncturist
- 9. Naturopath or alternative health practitioner
- 10. Dentist or orthodontist
- 11. Masseur
- 12. Other [SPECIFY] _____
- X Don't know
- R Refused