Australian Government
Australian Institute of Health and Welfare
Department of Health and Ageing

Flinders UNIVERSITY

Number 10, September 2007

NISU Briefing

AIHW National Injury Surveillance Unit • Research Centre for Injury Studies • Flinders University • South Australia

Hospitalised football injuries 2004–05

Geoff Henley

September 2007

Key findings

- In 2004–05, there were 14,147 hospitalisations resulting from injuries received while playing some form of football. This represented 30.6% of all sports and leisure-related hospitalisations during this period.
- Australian football accounted for 30.3%, soccer for 24.0% and rugby for 20.7% of all football-related hospitalisations.
- Overall, 44.3% of all those hospitalised for football-related injuries were aged 15–24 years, while 90.3% of those hospitalised were aged 34 years or younger.
- Males accounted for 93.2% of all football-related hospitalisations.
- Knee and lower leg and head were the most common regions injured, accounting for 47.9% of all hospitalisations.
- Fractures were by far the most common type of injury requiring hospitalisation, accounting for 55.6% of all admissions.
- Over one-third (36.6%) of all injuries were due to some sort of fall while another 26.4% were due to some form of contact with another person
- The highest number of admissions occurred during May (18.1%) with 72% of all admissions occurring in the period from April to August.
- The mean number of bed days for all hospitalisations due to football-related injuries was 1.85 days.
- The estimated direct cost of football-related hospitalisations was close to $44 million.

Introduction

Several codes of football are played commonly in Australia. These include soccer, Australian football, rugby league and rugby union. Participation shows strong regional differences with Australian football being played predominantly in Victoria, South Australia and Western Australia and rugby being played predominantly in New South Wales and Queensland. Football is played mainly in winter, although seasons commonly extend from late autumn through to early spring.

In 2005, outdoor soccer was the ninth most popular sport in terms of overall participation and the fifth most popular organised sport for those aged 15 years and over (Australian Sports Commission 2005). There were approximately 614,300 participants Australia-wide, representing a participation rate of about 3.8% of the population aged 15 years and older. About 70% (n=431,100) of these participated in an organised form of the game. Indoor soccer was also popular with an estimated 264,100 participants (participation rate of 1.7%) aged 15 years and older. In 2005, Australian football was the 12th most popular sport in terms of overall participation and the sixth most popular organised sport for those aged 15 years and older. There were approximately 536,200 participants (participation rate of 3.4%), with about 72% (n=387,000) of these participating in an organised form of the game. During 2005, the number of participants aged 15 and over, for rugby league and rugby union were 195,900 (participation rate of 1.2%) and 165,900 (participation rate of 1.0%) respectively. Touch football was also popular with an estimated 367,200 participants (participation rate of 2.3%) in 2005.

There were strong regional differences in terms of the number of participants for each code across the different states and territories. Just over 50% (n=271,000) of all participants in Australian football resided in Victoria. For rugby, 54.8% (n=198,400) of all participants resided in New South Wales, while 31.2% (n=113,000) of all participants resided in Queensland. Touch football was also prominent in New South Wales and Queensland, with 46.5% (n=170,700) and 38.7% (n=142,000) of all participants respectively residing in these two states. Participant numbers for soccer were most prominent in New South Wales with 43.8% (n=384,500) of all participants and Victoria with 23.7% (n=208,000) of all participants.

The briefing that follows is a short overview of football-related hospitalisations in Australia during the 2004–05 financial year. It follows on from an earlier report which investigated football-related hospitalisations during the 2002–03 financial period (Flood & Harrison 2006). This report found that football was a significant contributor to all sports and leisure-related hospitalisations for this period, accounting for almost 28% of all admissions. This briefing also includes some trends analysis for the period from 2002–03 to 2004–05, the period for which a comparable classification has been in use.

Comparison to all sport and leisure

Football accounted for 30.6% (n=14,147) of all sports and leisure-related hospitalisations in 2004–05 (Table 1). Australian football was responsible for 9.2% (n=4,280) of all sports and leisure-related hospitalisations despite only accounting for 4% of all sports and leisure participants. Similarly, rugby was responsible for 6.3% (n=2,931) of all sports and leisure-related hospitalisations despite only accounting for 2.7% of all sports and leisure participants.

Table 1: Comparison of football hospitalisations to all sports and leisure hospitalisations, Australia, 2004–05

	Hospitalisations		Estimated participants[†]	
Code	Count	Per cent all sport & leisure	Count	Per cent all sport & leisure
Australian football	4,280	9.2%	536,200	4.0%
Rugby	2,931	6.3%	361,800	2.7%
Soccer	3,396	7.3%	878,400	6.6%
Touch	615	1.3%	367,200	2.8%
All football codes[††]	14,147	30.3%	NA	NA

[†] Available from the Australian Sports Commission 2005 annual report—Participation in exercise, recreation and sport (Australian Sports Commission 2005)

[††] Includes hospitalisations for other and unspecified football codes

Age

Australian football accounted for 30.3% (n=4,280), soccer for 24.0% (n=3,396) and rugby for 20.7% (n=2,931) of all football-related hospitalisations (Table 1). Football is played predominantly among younger age groups. Overall, 44.3% (n=6,274) of all those hospitalised for football-related injuries were aged 15–24 years, while 90.3% (n=12,780) of those hospitalised were aged 34 years or younger. Only 2.3% (n=328) of all hospitalisations were of people aged 45 and over. Nearly half of all hospitalisations in Australian football and rugby occurred in the 15–24 age group, while soccer and touch football experienced significantly lower percentages in this age group at 34.7% (n=1,178) and 30.2% (n=186) respectively. Soccer was the code with the highest percentage of hospitalisations in those aged 14 and under with 28.1% (n=953) of all admissions occurring in this age range.

Australian football experienced the highest rate of hospitalisations per 100,000 population with 21.2 (Table 2, Figure 1). This was significantly higher than both soccer (16.8 per 100,000) and rugby (14.5 per 100,000). Touch football had by far the lowest rate (3.0 per 100,000). In terms of participation rates, Australian football had the highest rate of hospitalisation per 100,000 participants with 634.7 (Table 2, Figure 2). This was followed by rugby with 606.4, although this rate was not significantly lower than that of Australian football. Both soccer and touch football had significantly lower rates with 278.1 and 131.5 respectively. Both rugby and Australian football had a peak rate of hospitalisations per 100,000 participants in the 25–34 year age group with 964.2 for rugby and 954.6 for Australian football.

Table 2: Summary measures for football related injury hospitalisations, by age group at admission, 2004–05

	Age group at admission (years)							
	0–14	15–24	25–34	35–44	45–54	55–64	65+	All ages (%)
Cases: Football	3,440	6,274	3,066	1,039	268	36	24	14,147 (100)
Australian rules	877	2,133	968	230	59	8	5	4,280 (30.3)
Soccer	953	1,178	696	427	114	12	16	3,396 (24.0)
Rugby league	278	491	186	28	8	..	0	993 (7.0)
Rugby union	60	187	80	22	..	0	0	351 (2.5)
Rugby, unspecified	399	745	327	93	17	5	..	1,587 (11.2)
Touch football	132	186	168	91	34	..	0	615 (4.3)
Football: other and unspecified	741	1,354	641	148	34	5	..	2,925 (20.7)
Estimated number of participants ('000)†								
Australian rules	NA	313.5	101.4	85.6	32.4	3.2**	0	536.2
Soccer	NA	491.4	227.9	109.9*	35.3*	13.9**	0	878.4
Rugby league	NA	129.5	35.9	26.4*	2.5**	1.7**	0	195.9
Rugby union	NA	108	25.6*	18.5*	8.1**	3.3**	2.4**	165.9
Touch football	NA	166.2	118.7	62.6	17.5*	0.6**	1.5**	367.2
Rate/100,00 population								
Australian rules	22.0	76.6	33.6	7.6	2.1	0.4	0.2	21.2
Soccer	23.9	42.3	24.2	14.2	4.1	0.6	0.6	16.8
Rugby	18.5	51.1	20.6	4.8	1.0	0.3	0.0	14.5
Touch football	3.3	6.7	5.8	3.0	1.2	0.2	0.0	3.0
Rate/100,00 participants								
Australian rules	NA	680.4	954.6	268.7	182.1	NA	0.0	634.7
Soccer	NA	239.7	305.4	388.5	322.9	NA	0.0	278.1
Rugby	NA	599.2	964.2	318.5	NA	NA	NA	606.4
Touch football	NA	111.9	141.5	145.4	194.3	NA	NA	131.5

Note: Case numbers when n<5 are not shown.

† The estimated number of participants was available for ages 15 years and older. Participation values are taken from 'Participation in Recreation and Sport' Annual Report 2005 (Australian Sports Commission 2005).

* Estimate has a relative standard error of between 25% and 50% and should be used with caution.

** Estimate has a relative standard error of greater than 50% and is considered too unreliable for general use.

The rate per 100,000 participants is not shown for those aged 55–64 for Australian football and soccer, those 45+ years for rugby and those 55+ for touch football due to high uncertainty in participation data.

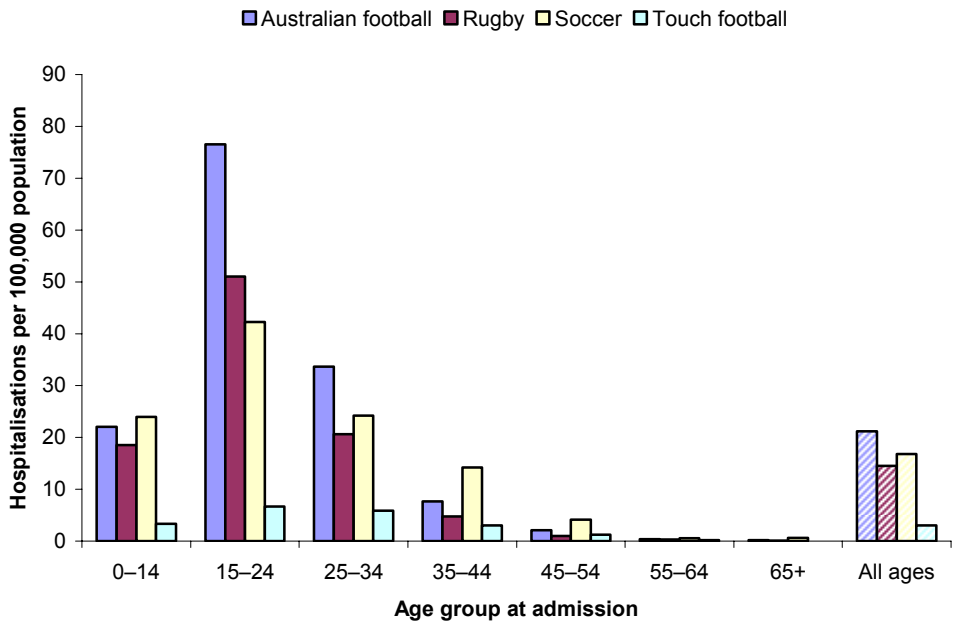
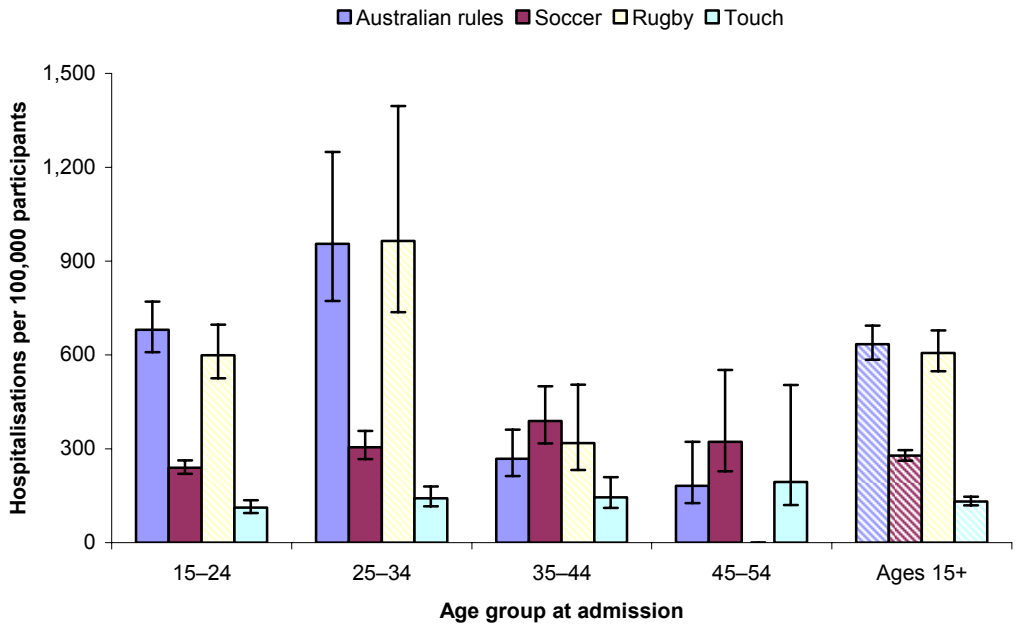


Figure 1: Hospitalisation rate per 100,000 population, due to football injury by age group at admission, Australia, 2004–05



Note: The hospitalisation rate per 100,000 participants excludes 2,699 cases of Australian football, soccer, rugby and touch football in those less than 15 years.

The rates for those aged 55-64 for all football codes, and those aged 45–55 for rugby are not shown due to high uncertainty.

Figure 2: Hospitalisation rate per 100,000 participants (15 years and over), due to football injury by age group at admission, Australia, 2004–05

Sex

All football codes are played much more commonly by males than females. There was less disparity of males to females for soccer (3.4:1) and touch football (1.9:1) than for Australian football (10.2:1) and rugby (13.5:1). The vast majority (93.2%) of hospitalised players were males, ranging from 97.7% for Australian football down to 70.1% for touch football. In males, hospitalisations were most common in Australian rules (31.7%, n=4,182), soccer (22.1%, n=2,917) and rugby (21.5%, n=2,830) (Table 3, Figure 3). For females, hospitalisations were most common in soccer (49.6%, n=479) and touch football (19.1%, n=184).

Across all football codes the rate of hospitalisations per 100,000 participants was higher for males than for females (Table 3, Figure 4). For Australian football, the rate of hospitalisations was 5.1 times higher in males than in females (683.8 vs 133.6). For soccer and rugby the rates were 2.0 and 1.8 times higher respectively. However, for rugby there is a relative standard error of between 25% and 50% for the value for females which is reflected in the wide confidence intervals. For touch football the rate of hospitalisations was only 1.3 times higher for males than for females (143.8 vs 108.5).

Table 3: Summary measures for football related injury hospitalisations, by sex, 2004–05

	Males (%)	Females (%)	Persons (%)
Cases: Football	13,182 (100)	965 (100)	14,147 (100)
Australian rules	4,182 ((31.7)	98 (10.5)	4,280 (30.3)
Soccer	2,917 (22.1)	479 (49.6)	3,396 (24.0)
Rugby league	979 (7.4)	14 (1.5)	993 (7.0)
Rugby union	320 (2.4)	31 (3.2)	351 (2.5)
Rugby, unspecified	1,531 (11.6)	56 (5.8)	1,587 (11.2)
Touch football	431 (3.3)	184 (19.1)	615 (4.3)
Football: other and unspecified	2,822 (21.4)	103 (10.6)	2,925 (20.7)
Estimated number of participants ('000)[†]			
Australian rules	488.3	47.9	536.2
Soccer	678.1	200.3	878.4
Rugby league	183.9	12[*]	195.9
Rugby union	152.9	13[*]	165.9
Touch football	240	127.2	367.2
Rate/100,00 population			
Australian rules	41.6	1.0	21.2
Soccer	29.0	4.7	16.8
Rugby	28.2	1.0	14.5
Touch football	4.3	1.8	3.0
Rate/100,00 participants			
Australian rules	683.8	133.6	634.7
Soccer	314.3	155.8	278.1
Rugby	625.6	348.0[*]	606.4
Touch football	143.8	108.5	131.5

[†] The estimated number of participants and the rate of hospitalisation per 100,000 participants for all ages do not include those less than 15 years.

[*] Estimate has a relative standard error of between 25% and 50% and should be used with caution.

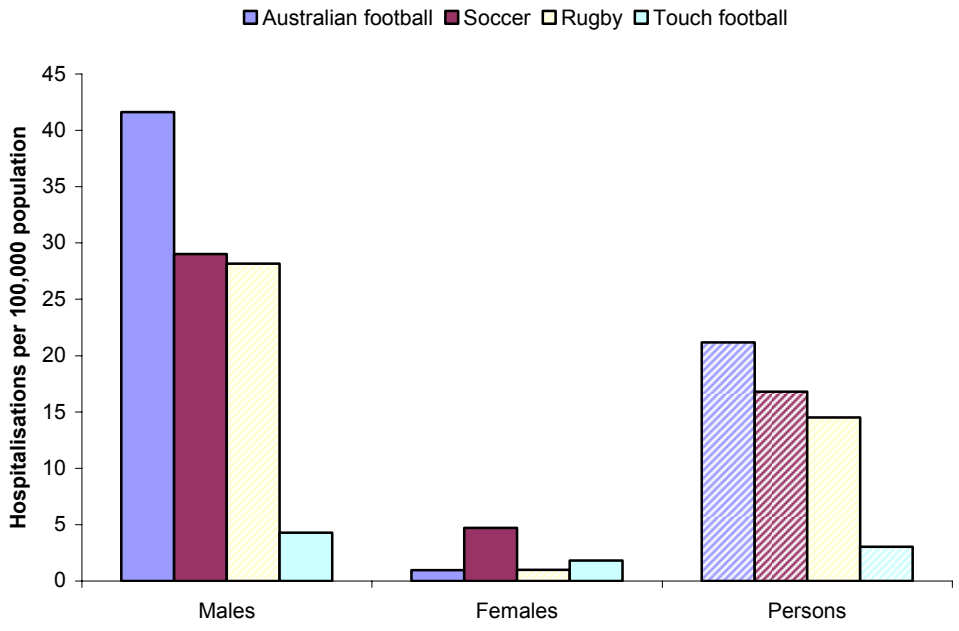
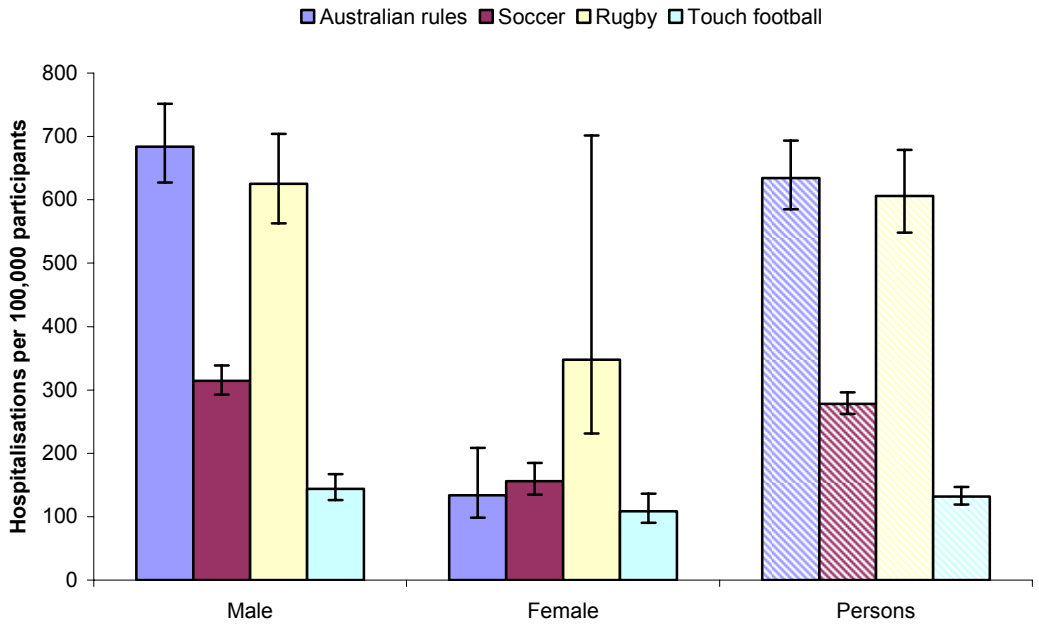


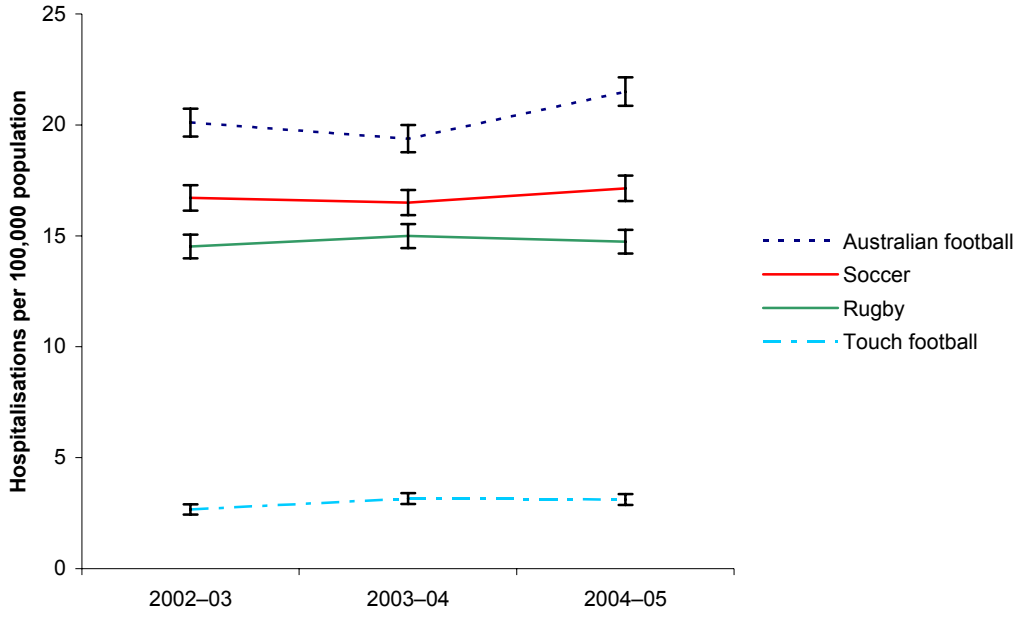
Figure 3: Hospitalisation rate per 100,000 population, due to football injury by sex, Australia, 2004–05



Note: The hospitalisation rate per 100,000 participants excludes 2,699 cases of Australian football, soccer, rugby and touch football in those less than 15 years.

Figure 4: Hospitalisation rate per 100,000 participants (15 years and over), due to football injury by sex, Australia, 2004–05

Trends



Note: Rates are age-adjusted against the 2001 Australian population.
Error bars are 95% confidence intervals based on a Poisson distribution.

Figure 5: Hospitalisation rate per 100,000 population, due to football injury by financial year of admission, Australia, 2002–03 to 2004–05

Rates of hospitalisation per 100,000 population have remained relatively stable across all football codes for the period from 2002–03 to 2004–05 (Figure 5). Percentage-wise, the largest change in rates was in touch football between 2002–03 to 2003–04 with rates increasing from 2.7 to 3.2 hospitalisations per 100,000 population, representing an increase of 18.5%. However, in 2004–05, rates for touch football dropped slightly to 3.1. The rate for Australian football increased from 19.4 to 21.5 hospitalisations per 100,000 population between 2003–04 to 2004–05, representing an increase of 10.8%. The rates for soccer and rugby remained virtually unchanged over the entire period.

State and territory of hospitalisation

New South Wales had the highest hospitalisation rate per 100,000 population for all football codes combined with 75.0 (Table 4, Figure 6). Victoria, Queensland and South Australia all had rates close to or slightly above the national rate of 69.6. All other states and territories had rates below the national average, although only Tasmania with 51.5 and Western Australia with 54.7 were significantly lower.

Victoria and South Australia had the highest hospitalisation rates per 100,000 population for Australian football with 44.2 and 43.3 respectively (Figure 7). Both these states had a rate more than twice the national average of 21.1 per 100,000 population. Western Australia, despite having slightly more participants for Australian football than South Australia, recorded a rate of 23.0 hospitalisations per 100,000 population, almost half of South Australia's rate. Victoria had the highest participation rate for people aged 15 and over with 6.7% followed by South Australia with 5.9%. Just over 50% of all Australian football players reside in Victoria. In terms of the hospitalisation rate per 100,000 participants for Australian football, there was a marked degree of variability between jurisdictions with New South Wales recording the highest rate of 1,075.6 followed by Tasmania with 852.8 and South Australia with a rate of 794.7 (Figure 8). Queensland recorded the lowest rate of 334.5, with Northern Territory the next lowest at 365.1.

New South Wales had the highest hospitalisation rate per 100,000 population for soccer with 24.3, followed by the Australian Capital Territory with a rate of 21.6. These were the only two states with rates which exceeded the national rate of 16.7. The Northern Territory had the lowest rate of 6.0 hospitalisations per 100,000 population. New South Wales had the highest hospitalisation rate per 100,000 participants with a rate of 318.3, followed closely by South Australia with 312.4 and Queensland with 301.9. Northern Territory had by far the lowest rate with 58.8.

Rugby is predominantly played in New South Wales and Queensland with 54.8% and 31.2% of all players aged 15 and over respectively. These two states had the highest hospitalisation rates per 100,000 population for rugby with a rate of 24.7 for New South Wales and a rate of 21.2 for Queensland. Victoria had the lowest rate of 2.5 hospitalisations per 100,000 population. Western Australia had the highest hospitalisation rate per 100,000 participants with 850.0 followed closely by the Australian Capital Territory with a rate of 823.5. Tasmania had the lowest rate with 375.0.

As with rugby, touch football is predominantly played in New South Wales and Queensland with 46.5% and 38.7% of all players aged 15 and over respectively. Queensland had the highest hospitalisation rate per 100,000 population for touch football with 5.8, followed by the Australian Capital Territory with a rate of 4.6. Victoria, South Australia and Tasmania had the lowest rates with rates 0.5, 0.7 and 0.6 hospitalisations per 100,000 population respectively. The Australian Capital Territory had the highest hospitalisation rate per 100,000 participants with a rate of 238.1 followed by Western Australia with 206.3. Tasmania had the lowest rate with 62.5.

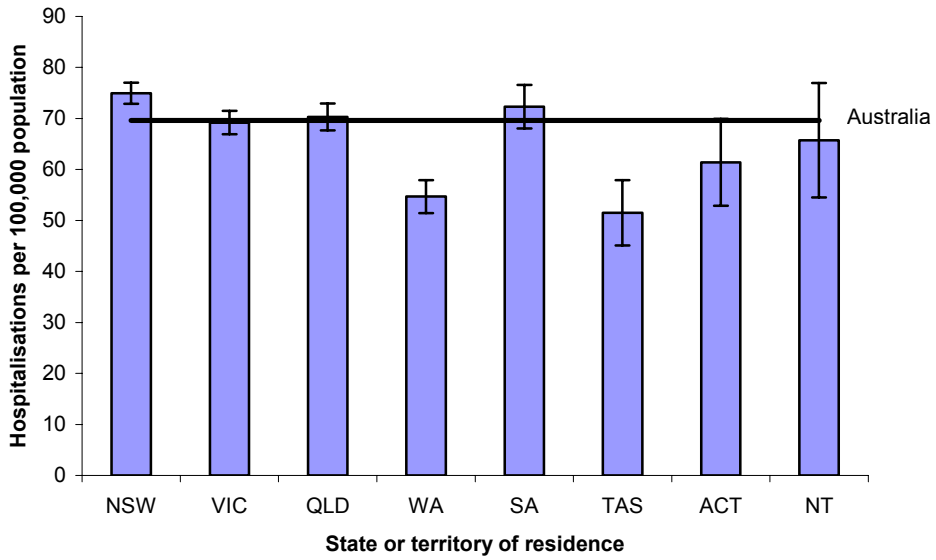
Table 4: Summary measures for football related injury hospitalisations, by state or territory, 2004–05

	State of residence								
	NSW	VIC	QLD	WA	SA	TAS	ACT	NT	Aust
Cases: Football	5,060	3,455	2,761	1,090	1,111	249	199	132	14,057
Australian football	475	2,208	246	458	666	166	21	28	4,268
Soccer	1,639	583	562	247	215	44	70	12	3,372
Rugby League	617	..	353	0	0	0	11	..	988
Rugby Union	226	..	99	..	..	0	11	..	349
Rugby, unspecified	826	118	381	123	47	16	26	26	1,563
Touch football	292	23	229	27	11	..	15	7	607
Football: other and unspecified	985	515	891	232	169	20	45	53	2,910
Estimated number of participants ('000)[†]									
Australian rules	34.4	271.0	55.9	76.0	72.1	16.3	4.2	6.3	536.2
Soccer	384.5	208.0	117.6	73.3	47.7	14.4	24.4	8.5	878.4
Rugby League	111.2	5.7[*]	60.9	5.7[*]	4.7[*]	1.9[*]	3.6	2.3	196.0
Rugby Union	87.2	9.3[*]	52.1	6.3[*]	4.6[*]	1.3[*]	4.0	1.1[*]	165.9
Touch football	170.7	11.9[*]	142.0	12.6	15.6	3.2	6.3	4.9	367.2
Rate/100,000 population									
Cases: Football	75.0	69.2	70.3	54.7	72.3	51.5	61.4	65.7	69.6
Australian football	7.0	44.2	6.3	23.0	43.3	34.3	6.5	13.9	21.1
Soccer	24.3	11.7	14.3	12.4	14.0	9.1	21.6	6.0	16.7
Rugby	24.7	2.5	21.2	6.3	3.3	3.3	14.8	15.9	14.4
Touch football	4.3	0.5	5.8	1.4	0.7	0.6	4.6	3.5	3.0
Rate/100,000 participants									
Australian football	1,075.6	638.4	334.5	465.8	794.7	852.8	404.8	365.1	632.8
Soccer	318.3	206.3	301.9	242.8	312.4	229.2	192.6	58.8	275.5
Rugby	624.5	700.0	531.0	850.0	462.4	375.0	513.2	823.5	599.1
Touch football	129.5	159.7	123.2	206.3	70.5	62.5	238.1	122.4	129.4

Note: Case numbers when n<5 are not shown.

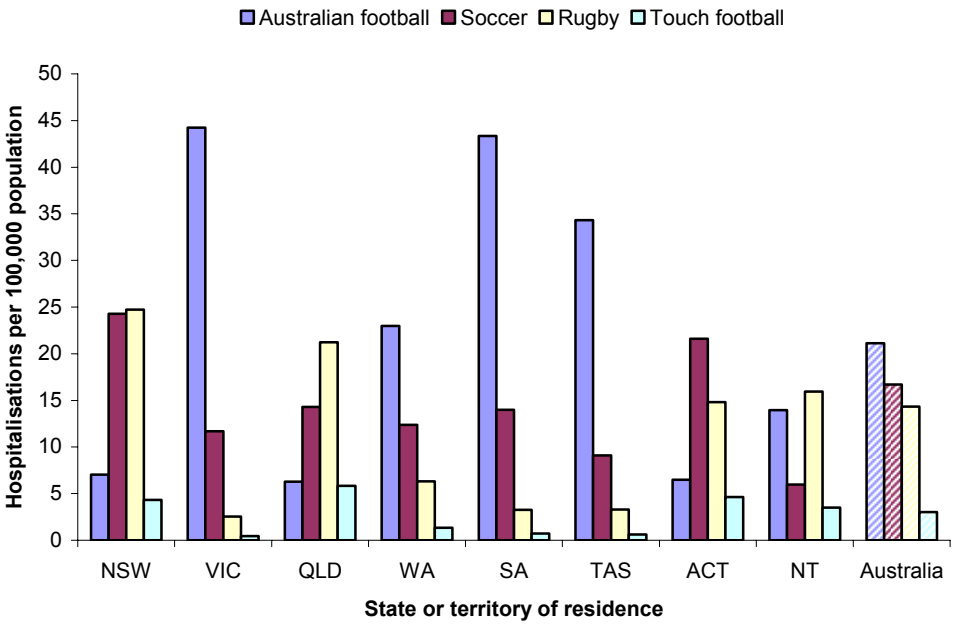
[†] The estimated number of participants and the rate of hospitalisation per 100,000 participants for all ages do not include those less than 15 years.

[*] Estimate has a relative standard error of between 25% and 50% and should be used with caution.



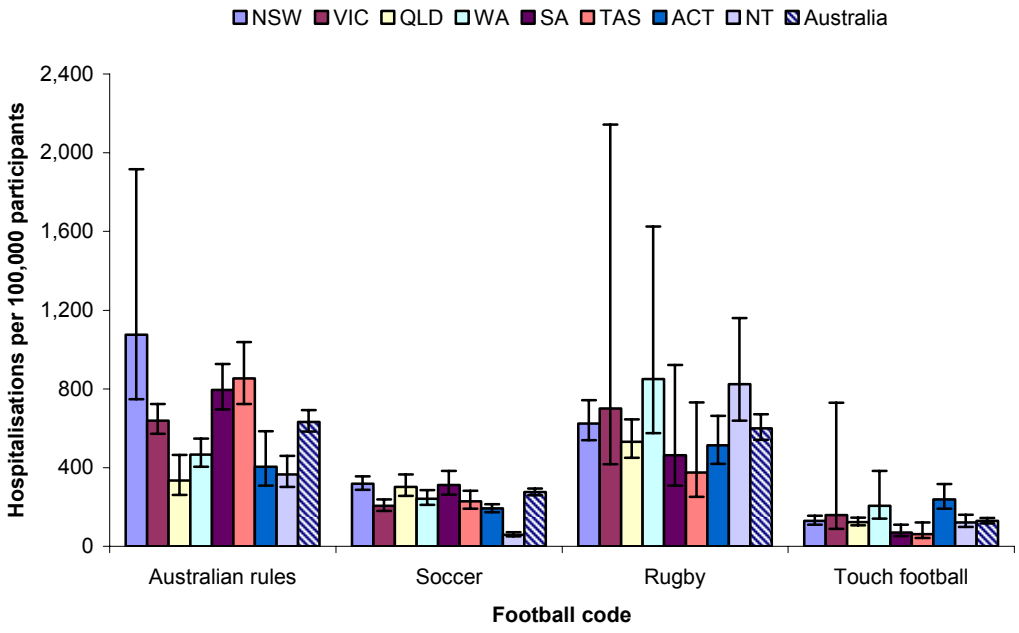
Note: Cases where state of residence was 'other territory' (n=17) or unknown (n=73) are not shown.
Error bars are 95% confidence intervals based on a Poisson distribution.

Figure 6: Hospitalisation rate per 100,000 population, due to football injury by state or territory of residence, Australia, 2004–05



Note: Cases where state of residence was 'other territory' (n=17) or unknown (n=73) are not shown.

Figure 7: Hospitalisation rate per 100,000 population, due to football injury by state or territory of residence, Australia, 2004–05



Note: The hospitalisation rate per 100,000 participants excludes 2,699 cases of Australian football, soccer, rugby and touch football in those less than 15 years.

Cases where state of residence was 'other territory' (n=17) or unknown (n=73) are not shown.

Figure 8: Hospitalisation rate per 100,000 participants (15 years and over), due to football injury by state or territory of residence, Australia, 2004–05

Body region

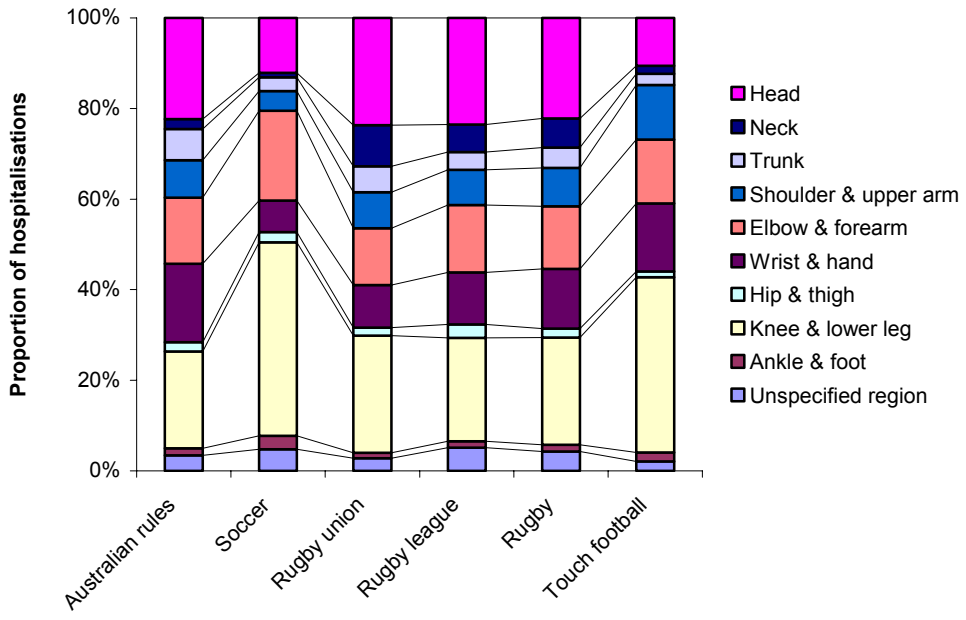


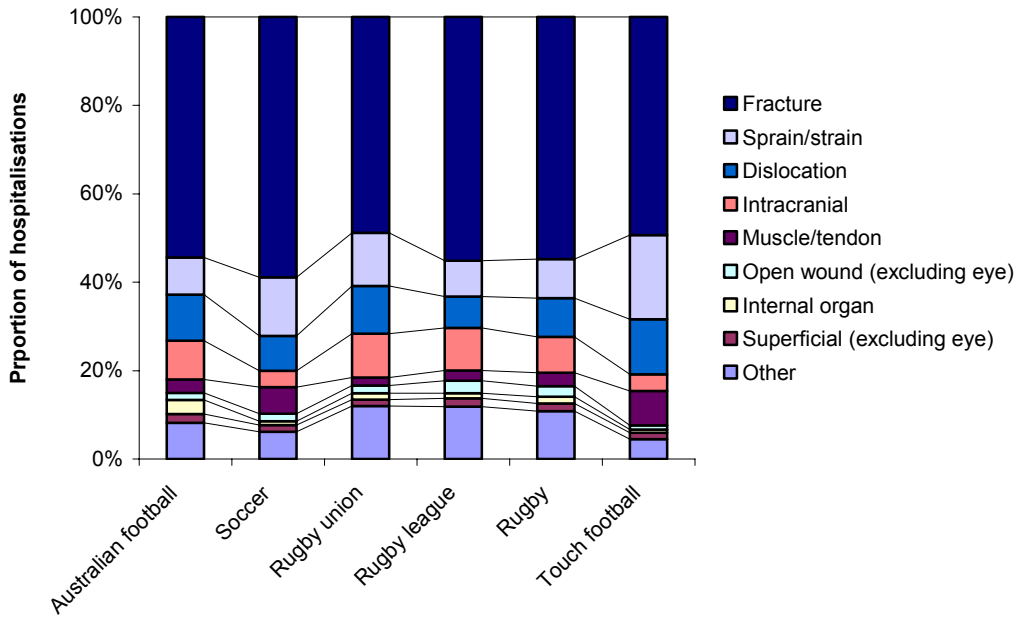
Figure 9: Hospitalisations due to football injury by principal body region injured, Australia, 2004–05

Head, knee and lower leg injuries were the most common reasons for hospitalisation across all football codes (Figure 9). Rugby union and rugby league both had the highest proportion of hospitalisations due to head injury with 23.6% each (n=83 for union, n=234 for league), followed closely by Australian football with 22.4% (n=957). For rugby union and rugby league combined, the proportion of hospitalisations due to head injury was 22.2% (n=650).

Soccer had the highest proportion of hospitalisations due to knee and lower leg injuries with 42.7% (n=1,451), followed closely by touch football with 38.7% (n=238). Knee and lower leg injuries were also prominent among Australian football and both rugby codes with proportions of these injuries varying from 21.4% (n=914) for Australian football to 25.9% (n=91) for rugby union. Injuries to the upper limb were also prominent across all codes, accounting for over 37% (n=5,296) of all hospitalisations.

In terms of neck injuries, rugby union had the highest proportion with 9.1% (n=32) followed by rugby league with 6.0% (n=60). The proportion of neck injuries for both forms of rugby combined was 6.4% (n=189).

Nature of injury



Note: Excludes 514 cases where nature of injury was not specified by principal diagnosis.

Figure 10: Hospitalisations due to football injury, by nature of injury, Australia, 2004–05

Fractures were by far the most common type of injury requiring hospitalisation across all football codes, accounting for 55.6% (n=7,581) of all injuries (Figure 10). Sprains and strains accounted for 10.2% (n=1,397) of all hospitalisations, dislocations for 9.6% (n=1,309) and intracranial injury for 6.6% (n=901). Fractures comprised 58.9% (n=1,920) of admissions in soccer, 55.1% (n=526) in rugby league, 54.4% (n=2,266) for Australian football, 48.8% (n=167) for rugby union and 49.3% (n=298) for touch football. Rugby union experienced the highest proportion of hospitalisations due to intracranial injury with 9.9% (n=34), followed closely by rugby league with 9.6% (n=92) and Australian football with 8.7% (n=364). Cases occurring in soccer and touch football were less likely to be due to intracranial injury with 3.7% (n=121) and 3.8% (n=23) respectively.

When examined at a more detailed level, the most common type of injury across all codes was a fracture to the lower end of the radius (Table 5). This injury accounted for 11.8% (n=401) of all hospitalised soccer injuries and 9.4% (n=58) of all hospitalised injuries from touch football. When looking at all football codes, this injury accounted for 8.4% (n=1,192) of all admissions. Touch football had the highest proportion of hospital admissions due to a rupture of the anterior cruciate ligament with 14% (n=86), followed by soccer with 9.4% (n=319).

Concussion injuries were also prominent, particularly among rugby and Australian football codes. Rugby league had the highest proportion of concussions with a brief loss of consciousness with 5.8% (n=58), followed closely by rugby with 5.7% (n=20) and Australian football with 4.4% (n=190). However, when unspecified rugby cases were included, the overall proportion for rugby dropped to 4.5% (n=131). More serious forms of concussion involving longer periods of loss of consciousness were rare across all

football codes. Apart from concussion injury, there were 39 other cases of intracranial injury. These were spread relatively evenly among Australian football (11), soccer (10) and rugby (9) (data not shown). Of 28 cases experiencing some form of spinal cord injury, 17 (60.7%), all of which involved the cervical spinal cord, were due to rugby, and 6 (21.4%) were due to Australian rules (data not shown).

Table 5: Most common principal diagnoses, by football code, Australia, 2004–05

	Australian football		Rugby		Soccer		Touch football	
	Cases	Per cent	Cases	Per cent	Cases	Per cent	Cases	Per cent
Fracture of lower end of radius	334	7.8%	187	6.4%	401	11.8%	58	9.4%
Rupture of anterior cruciate ligament	204	4.8%	124	4.2%	319	9.4%	86	14.0%
Fracture of other finger	279	6.5%	124	4.2%	90	2.7%	42	6.8%
Loss of consciousness of brief duration	190	4.4%	131	4.5%	53	1.6%	9	1.5%
Fracture of nasal bones	143	3.3%	85	2.9%	97	2.9%	9	1.5%
Fracture of shaft of tibia	72	1.7%	80	2.7%	227	6.7%	12	2.0%
Fracture of lateral malleolus	104	2.4%	107	3.7%	122	3.6%	18	2.9%
Fracture of lower end of tibia	78	1.8%	85	2.9%	168	4.9%	13	2.1%
Dislocation of shoulder joint	112	2.6%	87	3.0%	42	1.2%	31	5.0%
Concussion	136	3.2%	78	2.7%	52	1.5%	10	1.6%
Fracture of other metacarpal bone	128	3.0%	53	1.8%	34	1.0%	18	2.9%
Fracture of other parts of lower leg	64	1.5%	63	2.1%	101	3.0%	15	2.4%
Tear of meniscus, current	98	2.3%	30	1.0%	92	2.7%	13	2.1%
Injury of achilles tendon	30	0.7%	29	1.0%	147	4.3%	28	4.6%
Fracture of malar and maxilary bones	107	2.5%	42	1.4%	42	1.2%	8	1.3%
Fracture of clavicle	77	1.8%	46	1.6%	26	0.8%	17	2.8%
Fracture of first metacarpal bone	81	1.9%	65	2.2%	12	0.4%	5	0.8%
Fracture of shafts of both ulna and radius	59	1.4%	31	1.1%	55	1.6%	9	1.5%
Fracture of shaft of radius	47	1.1%	52	1.8%	17	0.5%	..	..
Fracture of upper end of tibia	35	0.8%	35	1.2%	53	1.6%	9	1.5%
Fracture of thumb	40	0.9%	27	0.9%	24	0.7%	6	1.0%
Fracture of angle of jaw	44	1.0%	38	1.3%	5	0.1%	..	..
Injury to multiple structures of knee	37	0.9%	16	0.5%	30	0.9%	8	1.3%
Total	**2,499**	**58.4%**	**1,615**	**55.1%**	**2,209**	**65.0%**	**428**	**69.6%**

Note: Case numbers when n<5 are not shown.

Rugby includes all cases coded to rugby union, rugby league and rugby, unspecified.

Cases of other football (n=2,925) are not shown.

Mechanism of injury

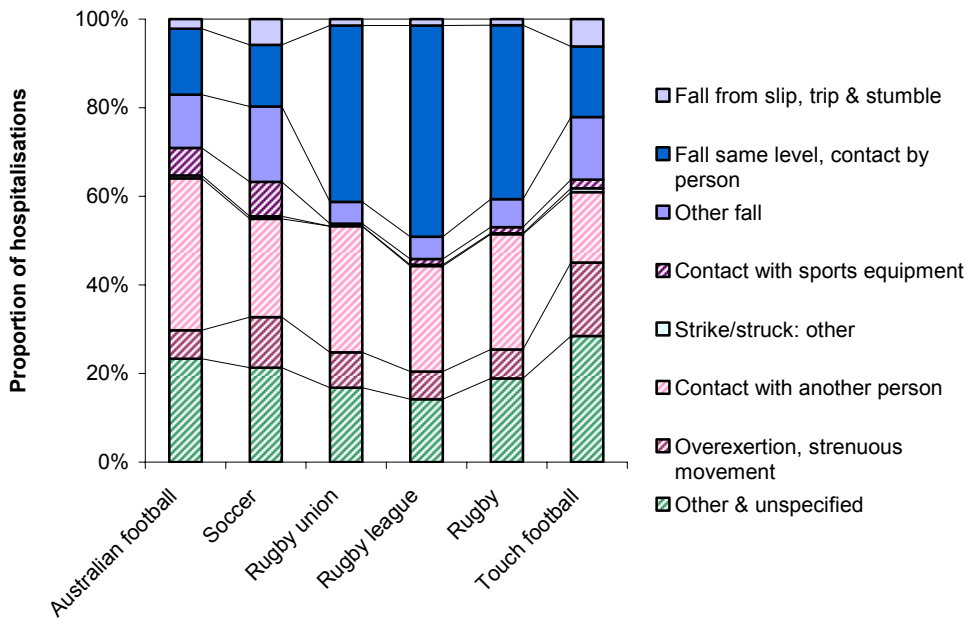


Figure 11: Hospitalisations due to football injury, by mechanism of injury, Australia, 2004–05

Falls were the most common mechanism of injury in rugby league (54.2%, n=538) and rugby union (46.2%, n=162), with the majority of these due to fall on same level from contact by person (Figure 11). Across all codes, falls accounted for 36.6% (n=5,177) of all hospitalisations. Contact with another person was the most common mechanism of injury resulting in hospitalisation for Australian football (1,467, 34.3%). This mechanism was also prominent in other codes including rugby union (100, 28.5%), rugby league (236, 23.8%) and soccer (754, 22.2%). Across all football codes, the most common single mechanism leading to hospitalisation was contact with another person which accounted for 26.4% (n=3,741) of all admissions, followed by fall on same level after contact with another person which accounted for 21.6% (n=3,055) of all hospitalisations.

Place of occurrence

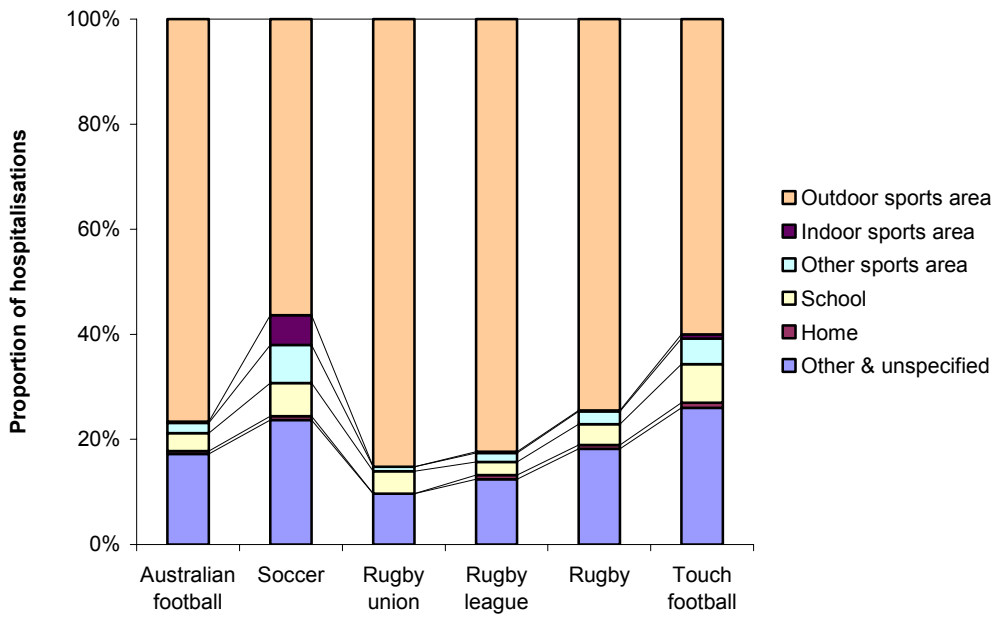


Figure 12: Hospitalisations due to football injury, by place of occurrence, Australia, 2004–05

By far the most common location for injuries resulting in hospitalisation were outdoor sporting areas which accounted for 67.5% (n=9,543) of injuries across all codes (Figure 12). Rugby union experienced the highest proportion of hospitalisations due to injuries occurring on outdoor sporting areas with 85.2% (n=299), followed by rugby league with 82.4% (n=818), Australian football with 76.7% (n=3,279), touch football with 60% (n=369) and soccer with 56.4% (1,914). Touch football had the highest proportion of hospitalisations due to injuries occurring at school with 7.3% (n=45) followed by soccer with 6.3% (n=214). Soccer was the only code with a significant proportion of injuries occurring on an indoor sports area with 5.7% (n=192) of injuries occurring at this location. Across all football codes, 19.9% (n=2,818) of cases were coded to an unspecified place of occurrence and 1% (n=141) were coded to 'other specified place of occurrence'. Only 3 cases did not have a place of occurrence code.

Month of admission

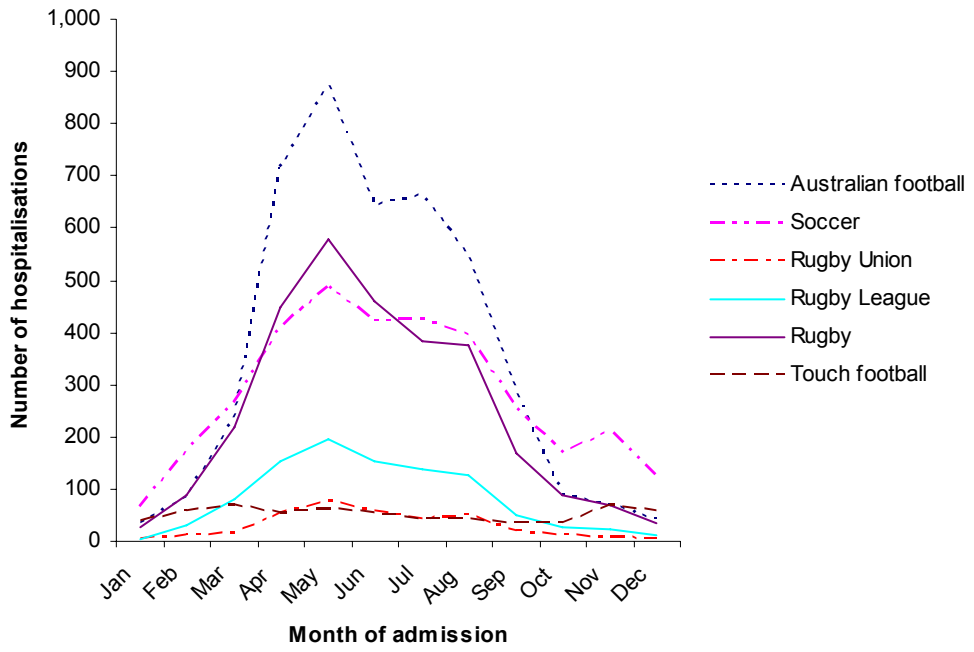


Figure 13: Hospitalisations due to football injury, by month of admission, Australia, 2004–05

All football codes except for touch football have the peak number of admissions during the colder months (Figure 13). This was most pronounced for Australian football. The peak number of admissions for all codes except for touch football occurred in May. Australian football had the highest numbers of admissions during this month with 872, representing just over 20% of all admissions for this code. Rugby had the next highest number of admissions during May with 580 (19.8%), followed by soccer with 488 (14.4%). Admissions for touch football were spread relatively evenly across the year with a peak number of admissions of 69 (11.2%) occurring in November. Overall, just over 72% of all admissions occurred in the period from April to August.

Length of stay

All hospitalisations

Table 6: Football related hospitalisations by mean bed days and total bed days, Australia, 2004–05

	Males		Females		Persons	
	Total bed days†	Mean bed days††	Total bed days†	Mean bed days††	Total bed days†	Mean bed days††
Australian football	6,912	1.65	161	1.64	7,073	1.65
Soccer	5,557	1.91	813	1.70	6,370	1.88
Rugby league	1,961	2.00	22	1.57	1,983	2.00
Rugby union	644	2.01	62	2.00	706	2.01
Rugby	6,724	2.38	235	2.33	6,959	2.37
Touch football	751	1.74	286	1.55	1,037	1.69
All football codes	24,525	1.86	1,623	1.68	26,148	1.85

† Total bed days including inward transfers.

†† Total bed days (including inward transfers) divided by cases (excluding inward transfers).

Overall, the mean number of bed days for all hospitalisations due to football-related injuries was 1.85 days (Table 6). Rugby (league and union combined) had the highest mean number of bed days with 2.37. This value was significantly elevated by the long mean length of stay for unspecified rugby cases (2.69 days; data not shown). For unspecified rugby, there were five cases, three of which involved spinal cord injury, with hospital stays of longer than 100 days, with one case spending 298 days in hospital. Removal of these five cases resulted in the mean number of bed days for unspecified rugby cases dropping to about 2.14 days. None of the other football codes had any cases where the length of stay exceeded 100 days. When considered separately both rugby league and rugby union had mean number of bed days close to 2. All other codes had mean number of bed days less than 2.01 with Australian football having the lowest number of days with 1.65. The mean number of bed days for males was moderately higher for males than for females across all codes with the largest difference being for rugby league (2.00 vs 1.57 days).

Chronic injury

Table 7: Football related hospitalisations for cases with spinal cord and traumatic brain injury by mean bed days and total bed days, Australia, 2004–05

			Traumatic brain injury			
	Spinal cord injury		Brain injury other than concussion		Concussion injury only	
	Total bed days	Mean bed days	Total bed days	Mean bed days	Total bed days	Mean bed days
Australian football	100	11.11	68	5.23	500	1.18
Soccer	..	..	258	17.20	155	1.19
Rugby league	..	..	15	2.50	114	1.16
Rugby union	..	..	0	0.00	104	2.81
Rugby	941	42.77	347	28.92	363	1.42
Touch football	0	0.00	5	2.50	25	1.00
All football codes‡	1,233	33.32	728	14.56	1,267	1.24

Note: Case numbers when n<5 are not shown.

† Total bed days including inward transfers.

†† Total bed days (including inward transfers) divided by cases (excluding inward transfers).

‡ Includes hospitalisations for other and unspecified football codes

Some types of injury, including spinal cord injury and brain injury, have potentially long-lasting or permanent consequences. Table 7 presents a summary of these types of cases, selected on the basis of Principal Diagnosis. The mean number of bed days for football-related hospitalisations where the patient had suffered some form of spinal cord injury was 33.32 days (Table 7). Rugby had by far the highest mean number of bed days with 42.77 followed by Australian football with 11.11. The mean number of bed days for these two codes was way above the average for all football-related hospitalisations of 1.85 days. The mean number of bed days for football-related hospitalisations where the patient had suffered some form of traumatic brain injury varied markedly depending on whether the patient had a brain injury other than a concussive injury (14.56 days) or whether the patient only had a concussive brain injury (1.24 days). There was significant variation in the mean number of bed days across football codes for patients with brain injury other than concussive injury, with rugby having the highest number of mean bed days with 28.92 days, followed by soccer with 17.20 days. There was less variation for patients whose only brain injury was a concussive injury, with the mean number of bed days ranging from 1.00 days for touch football to 2.81 days for rugby union.

Costing of hospitalisations

Table 8: Estimated cost of treatment for all football-related hospitalisations by football code, Australia, 2004–05

Football code	Estimated cost
Australian football	$13,107,051
Soccer	$11,240,065
Rugby	$9,133,304
Touch football	$2,039,920
Other and unspecified football	$8,410,862
All football	**$43,931,202**

It has been estimated that sports injuries cost Australia approximately $2 billion during 2005 (including health professional costs and indirect costs such as time away from work) (Medibank Private Limited 2006). Table 8 shows estimated direct costs (i.e. costs incurred directly as a result of hospital treatment) for football codes during 2004–05. These estimates were calculated using the diagnosis related group (DRG) assigned to each hospitalisation. The total direct cost of hospital inpatient treatment of injuries sustained in all football codes in 2004–05 was estimated to be close to $44 million with Australian football accounting for just over $13.1 million and soccer accounting for around $11.2 million.

Outdoor vs indoor soccer

Indoor soccer was not formally introduced into Australia until 1984, but was quickly adopted by all states and territories. The game is played on a basketball sized court and a variety of surfaces can be used. The ball, which is especially designed for the game, is made of leather, with both senior and junior models. While the strategy is the same in both indoor and outdoor soccer, the confined area demands quick reflexes, fast thinking, and pin-point passing (McGrath & Ozanne-Smith 1997).

There is a limited amount of epidemiological data for indoor soccer injuries. Previous reports comparing injury rates between indoor and outdoor soccer suggest that the incidence of injury is higher in indoor soccer than outdoor soccer. Routley and Valuri reported that of players with soccer-related injuries reporting to emergency departments in Victoria, indoor soccer players were three times more likely to sustain an ankle sprain than outdoor soccer players and that overall, more lower limb injuries were reported in indoor soccer compared to outdoor soccer (Routley & Valuri 1993). A comparison of injuries among indoor and outdoor youth players revealed that the incidence of injury for indoor players was 6.1 times that of outdoor players when calculated per 100 hours of player game participation (Hoff & Martin 1986). However, these outcomes are not supported by later studies. Putukian et.al. investigated injuries resulting from the Soccer America Dawn to Dark Indoor Soccer Tournament (Putukian et al. 1996). They reported a rate of 4.44 injuries per 100 player hours, with 18.4% of injuries being classified as severe. They concluded that indoor and outdoor soccer had similar patterns of injury. A more recent study investigated the risk factors for injury in indoor versus outdoor soccer among adolescents reported an injury rate for indoor soccer of 4.45 injuries per 100 player hours, compared to 5.59 injuries per 100 player hours for outdoor soccer (Emery & Meeuwisse 2006). They concluded that there were no significant differences in overall injury rates found by gender or age group for indoor compared with outdoor soccer. However, none of the above studies made comparisons on the basis of hospitalised injury only.

In this report 56.4% (n=1,914) of all soccer injuries leading to hospitalisation were coded as having occurred on an outdoor sports arena, with only 5.7% (n=192) coded as having occurred on an indoor sports arena. This meant that for 38% (n=1,290) of hospitalised cases, it was not known if the injury occurred on an outdoor or indoor sports arena. Generally, injury outcomes were similar for both forms of the game, although small numbers, particularly for indoor soccer, made meaningful interpretations difficult. One notable difference includes a slightly higher proportion of hospitalisations due to knee and lower leg injuries with indoor soccer recording 49.5%, (n=95) compared to outdoor soccer with 44.4% (n=506). Another notable difference was for the proportion of hospitalisations due to an Achilles tendon injury where indoor soccer recorded 13% (n=25), significantly higher than for outdoor soccer where the proportion was only 4% (n=76). Further research involving the comparison of indoor to outdoor soccer hospitalised injury would require a higher ascertainment rate as to which form of the game the injured player was involved in.

Discussion

Football was responsible for 30.6% (n=14,147) of all sports-related hospitalisations during 2004–05. This represents a slight increase from the 27.7% reported by Flood and Harrison for 2002–03 (Flood & Harrison 2006). A previous study which investigated people with sports-related injuries presenting to hospital emergency departments in Queensland, found that football-related injuries made up just over 62% of all presentations (Hockey & Knowles 2000). This suggests that a significant proportion of those presenting to emergency departments with football-related injuries, do not have injuries severe enough to lead to admission. When looking solely at football-related hospitalisations, Australian football accounted for the highest proportion of these hospitalisations with 30.3%, followed by soccer with 24.0% and rugby with 20.7%. These proportions are comparable to those reported by Flood and Harrison. Australian football also had the highest rate of hospitalisations per 100,000 population with 21.2, followed by soccer with 16.8, rugby with 14.5 and touch football with 3.0. These rates are also comparable to those reported by Flood and Harrison, although direct comparisons were not possible for rugby as a whole, since they only reported separate rates for rugby league and rugby union. The lower rate of hospital admissions for soccer and touch football is most likely a reflection of the lower level of body contact when compared to rugby and Australian football

At this point, it should be noted that 54% (n=1,587) of all hospitalised rugby cases were coded as unspecified (i.e. not specified to be Union or League) compared to only 25% of rugby cases for the report by Flood and Harrison. The reasons for this high proportion of unspecified rugby cases are unclear. This has created difficulties in interpreting results separately for rugby league and rugby union both within this report and for making comparisons for these two codes between this report and that of Flood and Harrison. Hence, some caution should be used when interpreting results which apply separately to these codes. It should also be noted that results may also be influenced by the relatively high proportion of cases coded to unspecified football (20.1%, n=2,843). The proportion of unspecified football cases also varied markedly across jurisdictions, ranging from 7% (n=17) in Tasmania to 41.4% (n=55) for the Northern Territory.

In terms of participation rates, the highest rate of 634.7 admissions per 100,000 participants was recorded for Australian football, followed closely by rugby with 606.4. The rates for these two codes were more than twice that of soccer (278.1) and more than four and a half times that of touch football (131.5). The participation rate for Australian football is significantly lower than that reported by Flood and Harrison of 734.3, which was also the highest of all the football codes (Flood & Harrison 2006). However, this result may be affected by the accuracy of estimated participation rates. It should be noted that the estimated number of participants increased by 23.7% for Australian football between the period of this report and that of Flood and Harrison.

Football is played predominantly among younger age groups. Just over 90% of all hospitalisations were aged 34 years and under. Only 2.3% of all hospitalisations were aged 45 years and over. Nearly half of all hospitalisations in Australian rules and rugby were aged 15–24 years. Soccer players comprised the highest percentage of hospitalisations of those aged 14 and under with 28.1% of all admissions occurring in this age range. Football is played predominantly by males. Overall, 93.2% of hospitalisations were males, ranging from 97.7% for Australian football down to 70.1% for touch football. Across all codes, hospitalised rates per 100,000 participants for persons aged 15 and over were significantly higher for males than for females, ranging from 5.1 times higher for Australian football to 1.3 times higher for touch football. The

higher rates for males may be a reflection of a tendency for males to play these sports more aggressively, particularly in a high-level contact sport such as Australian football.

Generally, hospitalised rates per 100,000 population for each football code within each state or territory were a reflection of the popularity of that particular code within each jurisdiction. Victoria and South Australia had easily the highest rates for Australian football while New South Wales and Queensland had significantly higher rates for rugby. Interestingly, Western Australia, despite having slightly more participants for Australian football than South Australia, recorded a rate of 23.0 hospitalisations per 100,000 population, almost half of South Australia's rate of 43.3. A similar disparity was reported by Flood and Harrison (Flood & Harrison 2006). Western Australia had a higher proportion of cases coded to unspecified football than South Australia (20.6% vs 14.1%), and an unknown number of Australian football cases may have inadvertently been coded to this category. However, this alone could not account for the observed difference between the two states. There was also significant variation in rates for hospitalisations per 100,000 participants across jurisdictions, particularly for Australian football and rugby. While most of New South Wales is not a traditional Australian football region, this jurisdiction recorded the highest rate for this code (1,075.6), significantly higher than the next highest rate (852.8 for Tasmania), and well above the national rate of 632.8. In contrast, Queensland, another state that is not a traditional Australian football area, recorded the lowest rate of 334.5. The figure for New South Wales contrasts sharply with that reported by Flood and Harrison of 666.7. This difference appears to be, at least in part, due to a marked drop in the estimated number of participants for Australian football in New South Wales from 52,500 in the 2003 Australian Sports Commission report (Australian Sports Commission 2003) to only 34,400 in the 2005 report (Australian Sports Commission 2005). These estimates are based upon a sample survey taken across all states and territories and are subject to a significant degree of sampling variability. Thus, if the estimated number of participants for Australian football in New South Wales was substantially less than the true number of participants, this would lead to an overestimate of the true rate of hospitalisations per 100,000 participants. Conversely, an overestimate of the number of participants would lead to an underestimate of rates. A second factor which could impact upon rate calculations is the proportion of cases coded to unspecified football. This figure was particularly high in Queensland (31.6%, n=612). If a disproportionately high number of these cases were, in fact, Australian football, this would lead to underestimation of the true rate. With these factors in mind, the rates presented in this report in relation to hospitalisations per 100,000 participants should be treated with caution. In relation to rugby, Western Australia, not traditionally a rugby state, recorded the highest rate for hospitalisations per 100,000 participants of 850.0, marginally higher than that of the Northern Territory (823.5) and markedly higher than the national rate of 599.1. There was lesser variation in rates for soccer, although the Northern Territory's rate of 58.8 (based on a small number of cases) was much lower than all other jurisdictions and over four and a half times lower than the national rate of 275.5. Rates for touch football were the lowest of all four of the major codes with the Australian Capital Territory recording the highest rate of 238.1, well above the national average of 129.4. Again, with reference to the factors indicated above, these rates should be treated with caution.

Australian football and rugby recorded the highest proportions of head injuries with over one-fifth of all hospitalisations for these two codes sustaining an injury to this body region. Both of these sports have a high level of body contact through the nature of the tackling, and particularly in the case of Australian football, bumping. The nature of these body contacts can also frequently result in heavy contact with the playing surface. High marking, a feature of Australian football, can often result in players falling awkwardly and making heavy contact with the playing surface. Soccer recorded

the highest proportion of knee and leg injuries with 42.7% of all hospitalisations sustaining injuries to this region of the body. This result is most likely due to the nature of tackling in soccer, which frequently results in contact between player's legs, and often results in players falling awkwardly. Injuries to the upper limb were also prominent among all codes, most likely as a result of players putting out their arms to break their fall and consequently taking the major impact of colliding with the playing surface through this region of the body. Neck injuries were far more prominent in rugby than any of the other codes with 9.1% of rugby union players experiencing an injury to this body region. The proportions reported above were consistent with those found by Flood and Harrison (Flood & Harrison 2006).

Fractures were by far the most prominent type of injury with all codes recording proportions of hospitalisations close to or over 50%. Sprains/strains and dislocations were also prominent, both accounting for around 10% each of all hospitalisations for football. Intracranial injury, including concussive injury, was prominent in rugby league (9.9%), rugby union (9.6%) and Australia football (8.7%), with these proportions of hospitalisations being more than double those of soccer and touch football. This result correlates with the higher proportion of head injuries experienced by these two codes. These proportions contrasted with those of people presenting to hospital emergency departments in Queensland with football-related injuries (Hockey & Knowles 2000). Only just over 23% of these cases had fractures, 40% had sprains and strains and 6.4% had intracranial injuries. These results support the fact that people presenting with more serious injuries such as fractures and intracranial injuries are much more likely to be admitted than those with less serious injuries such as sprains and strains. Spinal cord injury was most prominent for rugby which recorded 17 of the 28 cases for all football codes. These injuries appear to be significantly influenced by the nature of body contact. A recent report indicates that the most common circumstances of spinal cord injury in rugby union was scrums, followed by tackles, whereas the majority of spinal cord injuries in rugby league were due to tackles (Berry et al. 2006). Compared to rugby union, rugby league has smaller, less powerful scrums with a greater emphasis on tackling. Rupture of the anterior cruciate ligament was particularly prominent for touch football (14.0% off all hospitalisations) and soccer (9.4% of all hospitalisations). Since touch football is predominantly a non-contact sport, the high proportion of this type of injury may possibly be due to the stress placed on the knee through twisting motions used by players when suddenly changing direction in order to avoid opponents.

Falls, usually after contact with another person, were the most common mechanism leading to hospitalisation in all codes except for Australian football. Falls were responsible for 54.2% of rugby league and 46.2% of rugby union hospitalisations. For Australian football, contact with another person, was the most common mechanism leading to hospitalisation. This is most likely due to rules of the game which allow players to bump opponents, usually through contact with the hip and shoulder. Contact through this manner can often be heavy, particularly if one or both players are moving relatively quickly.

Football is predominantly played on outdoor sports arenas, which accounted for at least 67.5% (n=9,543) of all hospitalisations due to football. The true figure is likely to be significantly higher due to the large percentage of cases (21.6%, n=3,056) where place of occurrence was coded to other and unspecified. It is likely that for a number of these cases, the injury occurred on some form of outdoor sports arena. Soccer was the only code where a significant number of injuries (n=192) occurred while playing on an indoor sports arena.

Overall, the mean number of bed days for all hospitalisations due to football-related injuries was 1.85 days. Surprisingly, Australian football, a high-level body contact game, recorded the lowest number of mean bed days with 1.65. Rugby had the highest number of mean bed days with 2.37. This value was elevated by the number of mean days for unspecified rugby cases which was 2.69 days. However, this higher rate for unspecified rugby cases is influenced by a small number of cases who spent long periods in hospital. These values for mean bed days were generally comparable to those reported by Flood and Harrison except in the case of hospitalisations for male rugby union players (Flood & Harrison 2006). They reported a mean value of 3.31 bed days compared to 2.01 bed days for this report. It is possible that these values could be influenced by a small number of cases with long stays in hospital as well as the higher percentage of unspecified rugby cases used in this report. When looking at chronic injury, those who sustained spinal cord injuries or injuries to the brain other than just concussive injury, were far more likely to spend significantly longer periods of time in hospital when measured against all cases of football-related hospitalisation. Not surprisingly, rugby accounted for the bulk of days spent in hospital due to spinal cord injury. Rugby also accounted for nearly half of all days spent in hospital due to brain injuries, other than those associated with concussive injury while, somewhat unexpectedly, soccer accounted for over a third of all days spent in hospital due to these type of injuries. Previous research suggests that multiple concussive or sub concussive blows to the head may cause cumulative brain injury and that this is possible in soccer (Kirkendall et al. 2001). How many of the hospitalisations for brain injury due to soccer was as a result of a single concussive event or due to the cumulative effects of several previous concussive events was not able to be determined from the data available to us.

References

Australian Sports Commission 2003. Participation in recreation exercise and sport. Annual report 2003:p1–65.

Australian Sports Commission 2005. Participation in exercise recreation and sport. Annual report 2005:p1–67.

Berry J, Harrison JE, Yeo D, Cripps R & Stephenson S 2006. Cervical spinal cord injury in rugby union and rugby league: are incidence rates declining in NSW? Australian and New Zealand Journal of Public Health 30 (3):268–74.

Emery CA & Meeuwisse WH 2006. Risk factors for injury in indoor compared with outdoor adolescent soccer. The American Journal of Sports Medicine 34 (10):1636–42.

Flood L & Harrison JE 2006. Hospitalised sports injury, Australia 2002–03. AIHW cat. no. INJCAT 79. Adelaide: AIHW.

Hockey R & Knowles M 2000. Sports injuries. Queensland Injury Surveillance Unit Injury bulletin 59 (May):1–6.

Hoff GL & Martin TA 1986. Outdoor and indoor soccer: Injuries among youth players. American Journal of Sports Medicine 14 (3):231–3.

Kirkendall DT, Jordan DE & WEG 2001. Heading and head injuries in soccer. Sports medicine 31 (5):369–86.

McGrath A & Ozanne-Smith J 1997. Heading injuries out of soccer: a review of the literature. Melbourne: Monash University Accident Research Centre.

Medibank Private Limited 2006. Safe sports report 2006. Melbourne: Medibank Private Limited.

Putukian M, Knowles WK, Swere S & Castle NG 1996. Injuries in indoor soccer. The Lake Placid dawn to dusk soccer tournament. The American Journal of Sports Medicine 24 (3):317–22.

Routley V & Valuri J 1993. Adult sports injury. Hazard 15 (July):1–10.

Data issues

Data

Cases are hospital separations from the National Hospital Morbidity Database from episodes in hospital where discharge occurred during the financial year to 30 June 2005 and where the left-most activity code is in the range U50.00 to U50.09. Cases involving transfer between hospitals were counted only once by omitting inward transfers from acute hospitals from the case counts (n=713).

Population data was obtained from the AIHW. Participation data from the Participation in Exercise and Recreation and Sport Annual Report 2005, has been used for calculation of participation-based rates. This is compiled from telephone surveys in February, May, August and November and collects information relating to participation in exercise, recreation and sport for the 12 months prior to interview. The total sample size was 13,726 persons aged 15 years and over, in private dwellings (Australian Sports Commission 2005).

Unless otherwise indicated, wherever the term 'rugby' is used throughout this report, it includes rugby league, rugby union and unspecified rugby cases. Similarly, unless otherwise indicated, the term 'soccer' includes both outdoor and indoor soccer cases.

Methods

All rates for age groups are age-specific crude rates. Unless otherwise stated, all population-based rates (i.e. rates calculated across all age groups) are crude rates. For charts showing hospitalisations per 100,000 participants, 95% confidence intervals for rates were calculated by keeping the numerator data (i.e. number of hospitalised cases) constant and increasing the denominator (i.e. estimated number of participants) by two standard errors to calculate the lower confidence limit, and then decreasing the denominator by two standard errors to calculate the upper confidence limit. The standard errors used for these calculations are listed on page 70 of the Participation in exercise, recreation and sport survey 2005 Annual Report published by the Australian Sports Commission (Australian Sports Commission 2005).

The total length of stay is the sum of the length of stay for all cases in a group of interest plus the length of stay for otherwise similar records where mode of admission was inward transfer from another acute hospital. Mean length of stay is the total length of stay divided by the number of cases.

Correspondence regarding this report can be addressed to the AIHW National Injury Surveillance Unit at Flinders University, GPO Box 2100, Adelaide, South Australia 5001, Tel: 08 8201 7602, Fax: 08 8374 0702, E-mail: nisu@flinders.edu.au

ISSN 1833-024X

INJCAT 103