Injury Surveillance Studies

Men's Sevens Series

Summary of Results: 2022/23

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1 Introduction

World Rugby is committed to implementing injury surveillance studies at all major World Rugby competitions and to disseminate the results within the Rugby community.

The aims of these studies are to:

- record and analyse injuries and illnesses sustained by male and female players at individual competitions,
- identify changing patterns of injury during competitions, and
- bring injury-related areas of concern to the attention of World Rugby's Chief Medical Officer.

The data collected in injury surveillance studies are also used to address player welfare issues in a broader context.

Previous surveillance studies for the Men's Sevens Series have reported the incidence and nature of match and training injuries sustained over the period from 2008/09 to 2021/22 (Fuller and Taylor, 2022). This current report continues the on-going study of the Men's Sevens Series by reporting match and training injuries and illnesses sustained during the 2022/23 Series. This report also combines the men's 2022/23 injury data with the data reported previously in order to provide an updated, long-term overview of the risks of injury in the Men's Sevens Series (Fuller and Taylor, 2021).

2 Methods

All studies were conducted in accordance with the definitions and protocols described in the World Rugby approved consensus statement on definitions and procedures for injury surveillance studies in Rugby (Fuller et al., 2007).

The definition of injury was: *'Any injury sustained during a Sevens Series Tournament match or training activity that prevents a player from taking a full part in all normal training activities and/or match play for more than one day following the day of injury'*. A recurrent injury was defined as: *'An injury (as defined above) of the same type and at the same site as an index injury and which occurs after a player's return to full participation from the index injury'.*

Specific injuries were classified using OSICS 10 (Orchard et al, 2010). Injury location, type and cause together with the event leading to the injury were also recorded.

The definition of an illness used in this study was: *'Any medical condition sustained while travelling to a Sevens Series Tournament, while at a Tournament or while travelling home at the end of a Tournament that prevents a player from taking a full part in all training activities and/or match play for more than one day following the day of onset of the illness.'*

Injuries and illnesses that were not related directly to Sevens Series rugby-related activities are not included in this report.

Injury/illness severity was determined by the number of days a player was injured/ill: a player was deemed to be 'injured/ill' until she could undertake full, normal training and be available for match selection, whether or not she was actually selected. Medical staff were required to make an informed clinical judgement about a player's fitness to train/play on those days when players were not scheduled to train or play. Injured/ill players were followed up after each tournament to obtain their return to play date: the return to play dates for players with injuries/illnesses that remained unresolved 3 months after the final day of the final tournament in the Series were defined on the basis of the clinical judgement and prognosis provided by the injured player's medical staff. The complete lists of categories and sub-categories used for categorising injury locations and injury types are provided in the Rugby injury consensus publication (Fuller et al., 2007).

Differences in players' anthropometric data were assessed using unpaired t-tests; differences in incidences, mean severity and proportions of injuries using z-tests; and differences in median severity using a Mann-Whitney U test. Differences in injury numbers were assessed using the chi-squared test. Trends in data over time were assessed using linear regression analyses. Statistical significance was accepted at the $p \leq 0.05$ level; it is recognised, however, that this approach could identify some differences as being statistically significant when they in fact occur by chance, due to the number of comparisons being made in the study. For this reason, exact p values (to 3 decimal places) are reported.

3 Data collection

Prior to the tournaments taking place, the purpose of the epidemiological study was outlined to each participating team. Each player's baseline anthropometric information was recorded (playing position [back, forward]; date of birth; body mass [Kg]; stature [cm]). Players joining a country's squad at a later date were added to the list of players and the anthropometric data recorded at the time the player joined the squad.

Medical staff prospectively recorded injuries/illnesses sustained during each tournament. A member of the team's medical staff also recorded detailed information about each injury and illness (date of injury/illness, date of return to play/training, location and type of injury/illness, cause of injury/illness, event leading to injury/illness). The final piece of information recorded is normally an injured/ill player's return-to-play/training date.

4 Results

Results from previous Men's Sevens Series competitions have been presented in earlier World Rugby reports (see: Fuller and Taylor, 2022).

The 2022/23 Men's Seven Series consisted of eleven tournaments (Hong Kong-2022, Dubai, South Africa, New Zealand, Australia, United States, Canada, Hong Kong-2023, Singapore, France, England) taking place between 4 November 2022 and 21 May 2023. The final tournament (England) included the qualifying competition for the men's 2023/24 Sevens Series. This study recorded players' anthropometric data and match and training injuries and illnesses sustained by the 15 core teams that participated in the full 2022/23 Series (Argentina, Australia, Canada, Fiji, France, Great Britain, Ireland, Japan, Kenya, New Zealand, Samoa, South Africa, Spain, Uruguay, USA) together with Tonga, who took part in the

2023/24 Sevens Series qualifying competition in England. Teams' match and tournament-based training activities were also recorded.

4.1 Players' anthropometric data

Anthropometric data for players from all participating teams were recorded. Table 1 summarises the numbers and anthropometric data for players categorised as backs, forwards and all players in the 2022/23 Sevens Series together, for comparison, with values averaged over the period 2008/09 to 2022/23.

Table 1: Players' anthropometric data: 2022/23 Sevens Series.

Series / Measure	**Mean** (*Standard deviation, number of players*)		
	Backs	***Forwards***	***ALL players***
2022/23			
Stature, cm	179.8 (6.9, 211)	186.1 (5.7. 154)	182.5 (7.1. 365)
Body mass, Kg	84.5 (7.1, 211)	94.0 (7.0, 154)	88.5 (8.5, 365)
Age, years	24.5 (3.9, 211)	24.8 (3.7, 154)	24.6 (3.8, 365)
All Series (2008/09 – 2022/23)			
Stature, cm	180.4 (6.4, 2621)	186.9 (5.7, 1822)	183.0 (6.9, 4462)
Body mass, Kg	86.3 (7.5, 2624)	96.1 (6.9, 1822)	90.3 (8.7, 4465)
Age, years	23.7 (3.5, 2623)	24.5 (3.7, 1822)	24.0 (3.6, 4464)

At the 2022/23 Sevens Series, forwards were significantly taller ($p<0.001$) and heavier ($p<0.001$) than backs but there was no significant difference in the players' ages ($p=0.459$).

Trends in players' age, stature and body mass over the period 2008/09 to 2022/23 are shown in Figures 1 to 3, respectively.

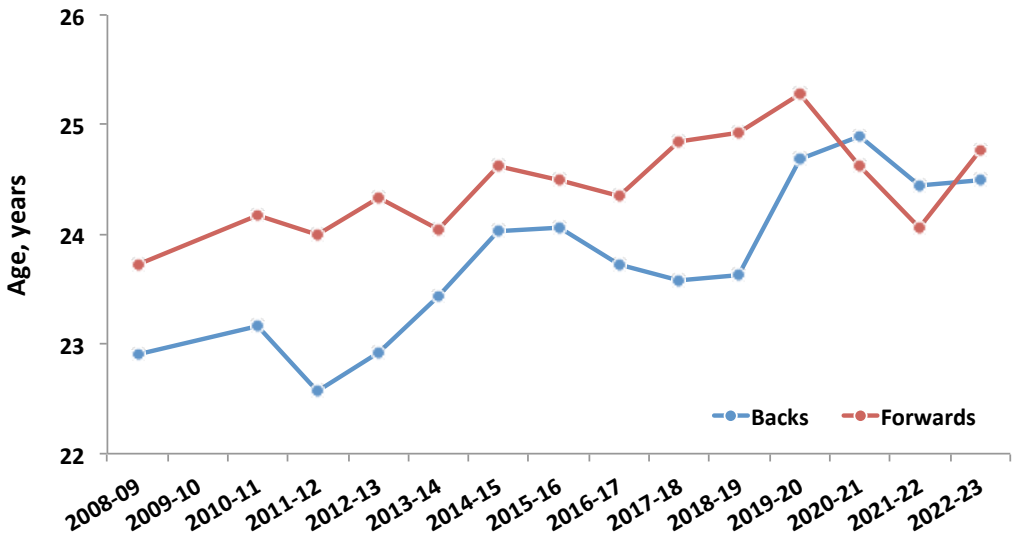

Fig 1. Long-term trends in players' age (years)

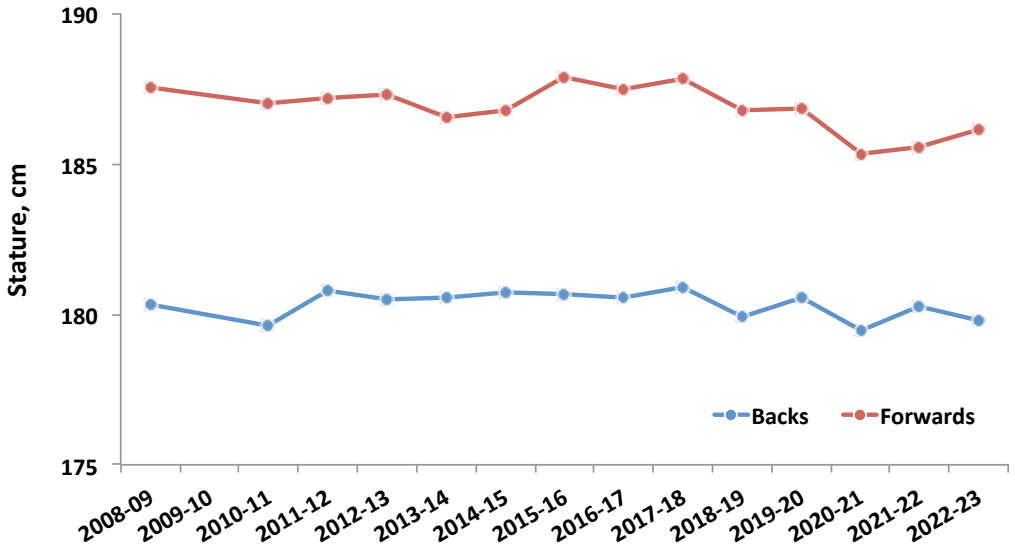

Fig 2. Long-term trends in players' stature (cm)

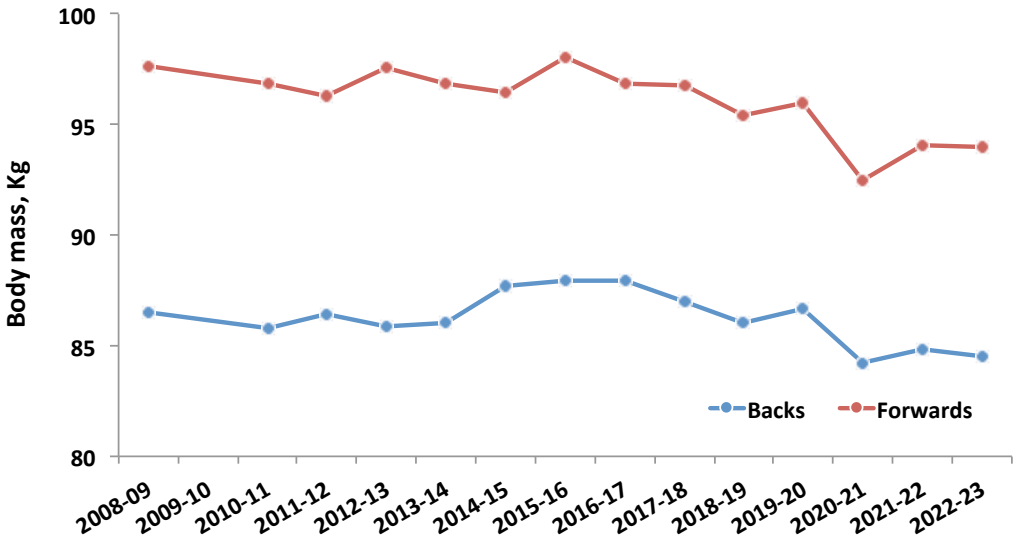

Fig 3. Long-term trends in players' body mass (Kg)

Averaged over the period 2008/09 to 2022/23, forwards were significantly older ($p<0.001$), taller ($p<0.001$) and heavier ($p<0.001$) than backs. There have been trends for increasing age for both backs ($p<0.001$) and forwards ($p=0.010$) and decreasing trends in stature ($p=0.024$) and body mass ($p=0.002$) amongst forwards over this period but no significant trends in stature ($p=0.369$) or body mass ($p=0.148$) for backs.

4.2 Match injuries

4.2a Incidence of injury

Table 2 summarises the numbers of match injuries, match exposures and incidences of match injuries sustained by backs, forwards and all players for the teams during the 2022/23 Sevens Series and the equivalent values for the period 2008/09 to 2022/23.

Table 2: Number, match exposure (player-hours) and incidence (injuries/1000 player-match-hours, 95% confidence interval) of match injuries: 2022/23 Sevens Series.

Series / Measure	*Backs*	*Forwards*	*ALL players*
2022/23			
Injuries	102	49	151
Exposure	868.0	651.0	1519.0
Incidence	117.5 (96.8 – 142.7)	75.3 (56.9 – 99.6)	99.4 (84.8 – 116.6)
All Series (2008/09 – 2022/23)			
Injuries	1176	693	1869
Exposure	8864	6648	15512
Incidence	132.7 (125.3 – 140.5)	104.2 (96.8 – 112.3)	120.5 (115.1 – 126.1)

There was a large statistically significant (p=0.015) difference in incidence values between backs and forwards during the 2022/23 Sevens Series. Over the long-term (Figure 4), the incidence of injury sustained by backs is significantly higher than that of forwards (p<0.001). Over this period (2008/09 to 2022/23), there has been an increasing trend in the incidence of injury for backs but the trend does not reach statistical significance (p=0.101). Over the same period, there has been no significant trend in the incidence of injury for forwards (p=0.241).

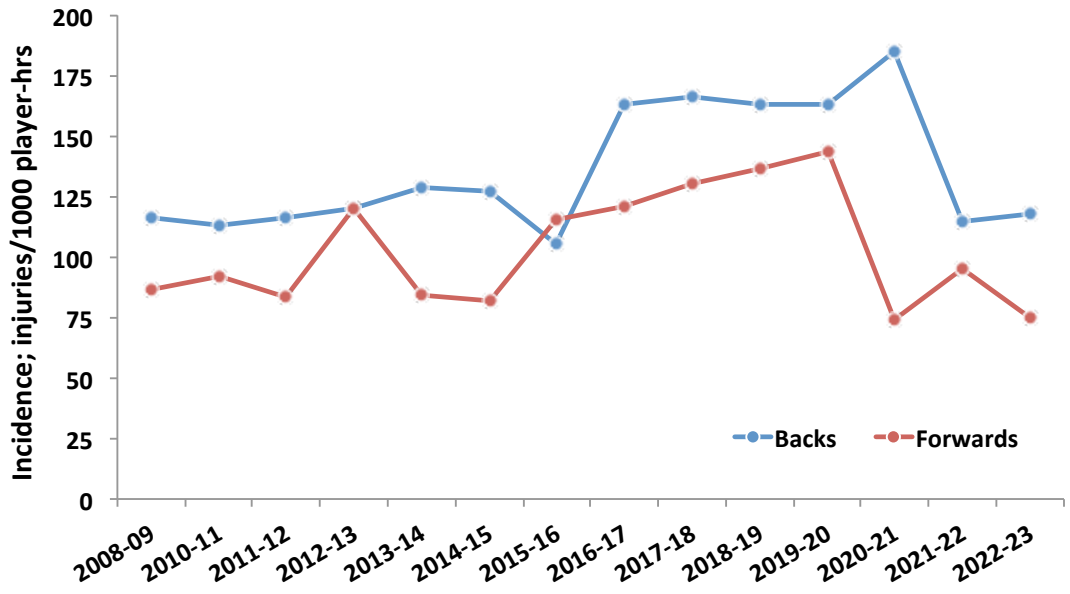

Figure 4. Long-term trends in the incidence of match injuries

4.2b Severity of injury

Table 3 summarises the mean and median severities of injuries sustained during the 2022/23 Sevens Series for backs, forwards and all players together with the average values observed over the period 2008/09 to 2022/23.

Table 3: Mean and median severities of match injuries: 2022/23 Sevens Series.

Series / Measure	***Severity (95% Confidence interval)**, days*		
	Backs	***Forwards***	***ALL players***
2022/23			
Mean	47.0 (36.7 – 57.3)	63.7 (41.4 – 86.0)	52.4 (42.3 – 62.5)
Median	28.5 (24.0 – 40.0)	33.0 (19.0 – 50.0)	31.0 (25.0 – 40.0)
All Series (2008/09 – 2022/23)			
Mean	45.4 (42.3 – 48.5)	44.9 (40.4 – 49.4)	45.2 (42.7 – 47.8)
Median	28.0 (26.0 – 30.0)	25.0 (22.0 -28.0)	27.0 (25.0 – 28.0)

There were no significant differences between backs and forwards for either the mean (p=0.184) or median (p=0.560) severity of injury during the 2022/23 Sevens Series.

There are no significant differences, over the period 2008/09 to 2022/23, between backs and forwards for either the mean (p=0.857) or median (p=0.074) severity values. Mean and median injury severity values over the period 2008/09 to 2022/23 are shown, for backs and forwards, in Figures 5 and 6, respectively. There is no significant trend in the mean severity for backs (p=0.111) but a significant increasing trend for forwards (p=0.049). There are no significant trends in the median severity for backs (p=0.374) or forwards (p=0.341).

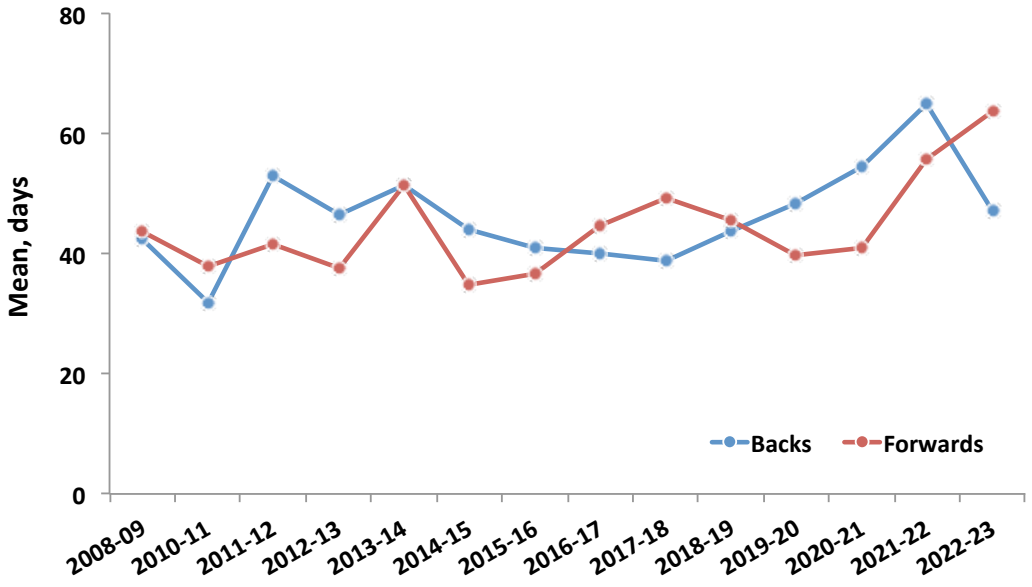

Fig 5. Long-term trends in mean severity

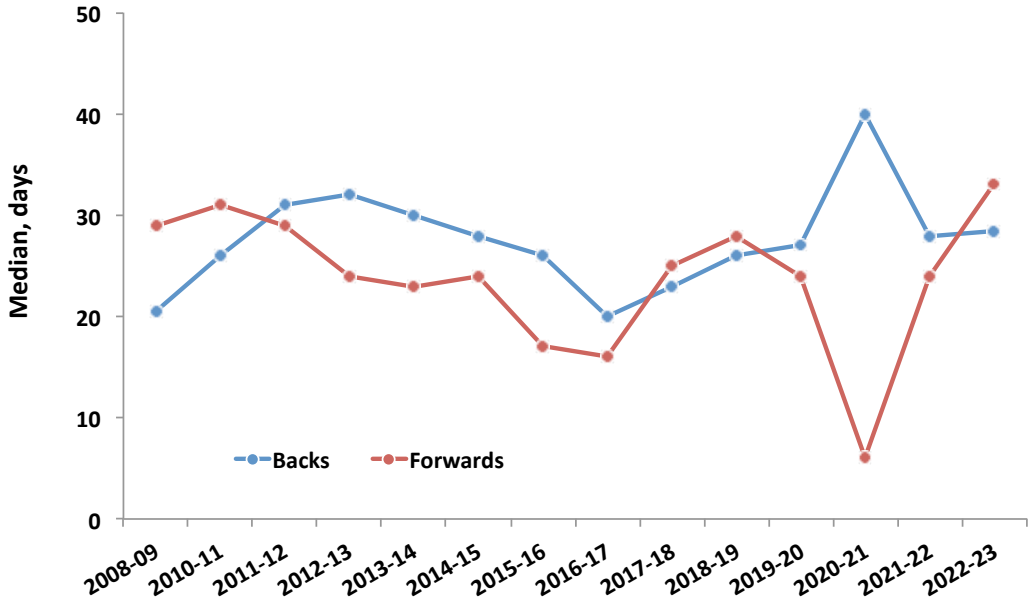

Fig 6. Long-term trends in median severity

Figures 7 and 8 show the proportions of injuries falling within the four broad severity categories for backs and forwards over the period 2008/09 to 2022/23:

Minor injuries:	2 – 7 days
Moderate injuries:	8 – 28 days
Severe injuries	29 – 90 days
Major injuries:	> 90 days.

Figures 7 and 8 illustrate the anomalous distributions of injury severities observed for both backs and forwards in 2020/21; this was due to the very small number of injuries reported during the Covid restricted competition. The distributions have returned to pre-Covid levels during 2021/22 and 2022/23. There is no statistically significant difference in the distributions for backs and forwards ($p=0.294$) for the injury severity distributions over the period 2008/09 to 2022/23.

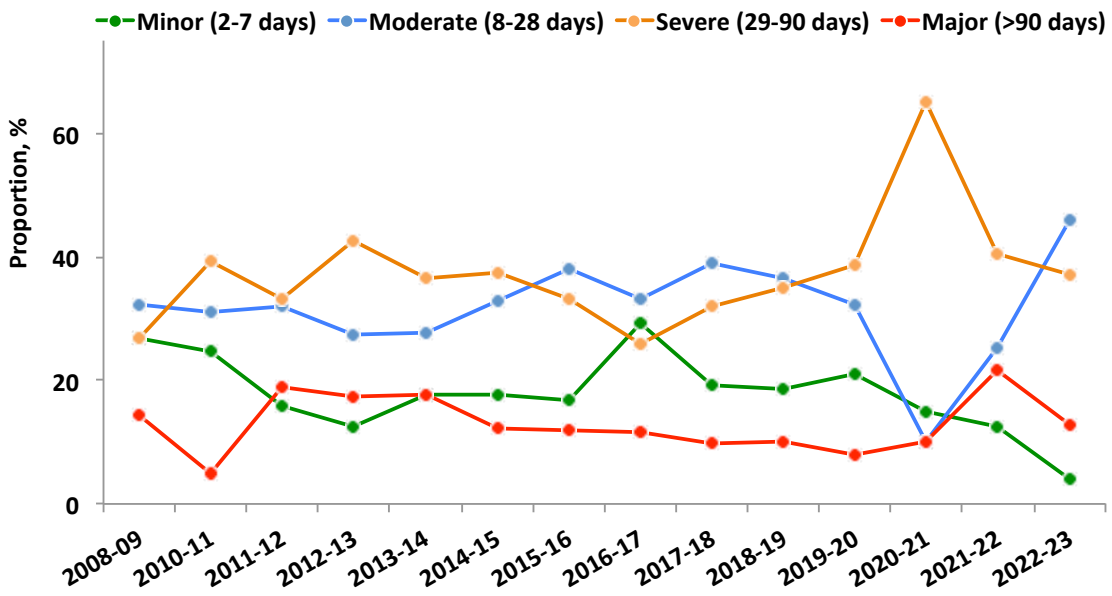

Fig 7. Long-term trends in injury severity categories for backs

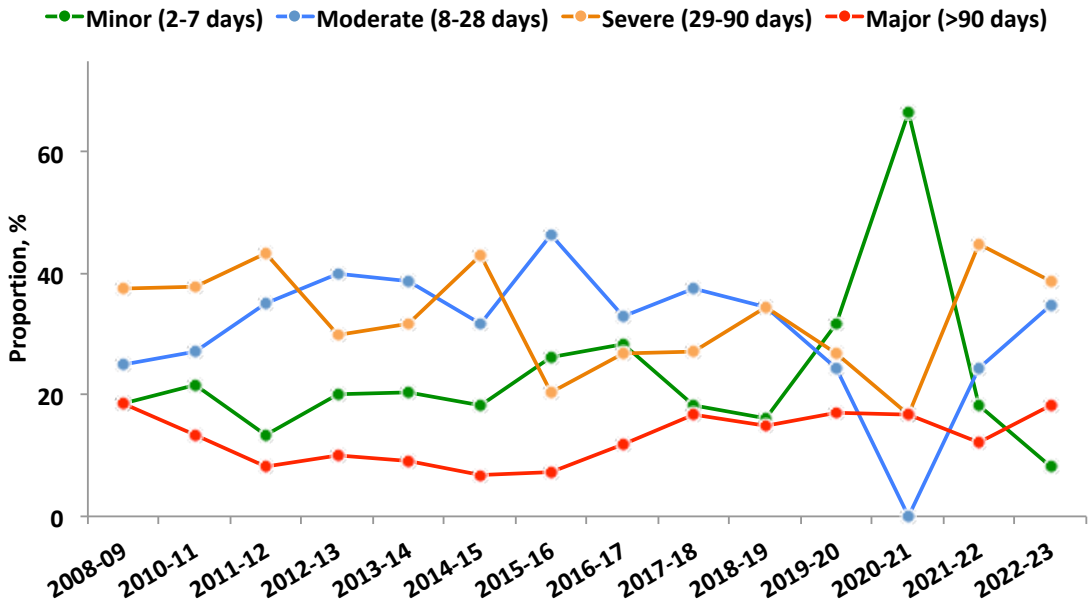

Fig 8. Long-term trends in injury severity categories for forwards

4.2c Injury burden

Injury burden, expressed as days-absence/1000 player-match-hours, combines the parameters of injury incidence and mean severity (Fuller, 2018) presented in the previous sections. The average injury burden value for backs in the period from 2008/09 to 2022/23 (6,023 days-absence/1000 player-match-hours; 95% CI: 5,688 – 6,377) is significantly ($p<0.001$) greater than the value for forwards (4,680 days-absence/1000 player-match-hours; 95% CI: 4,345 – 5,042). Figure 9 shows the variation of injury burden for backs and forwards over the period from 2008/09 to 2022/23. The increasing trends in injury burden values observed for backs ($p=0.024$) and forwards ($p=0.091$) reflect the injury incidence and mean severity values over the period 2008/09 to 2022/23.

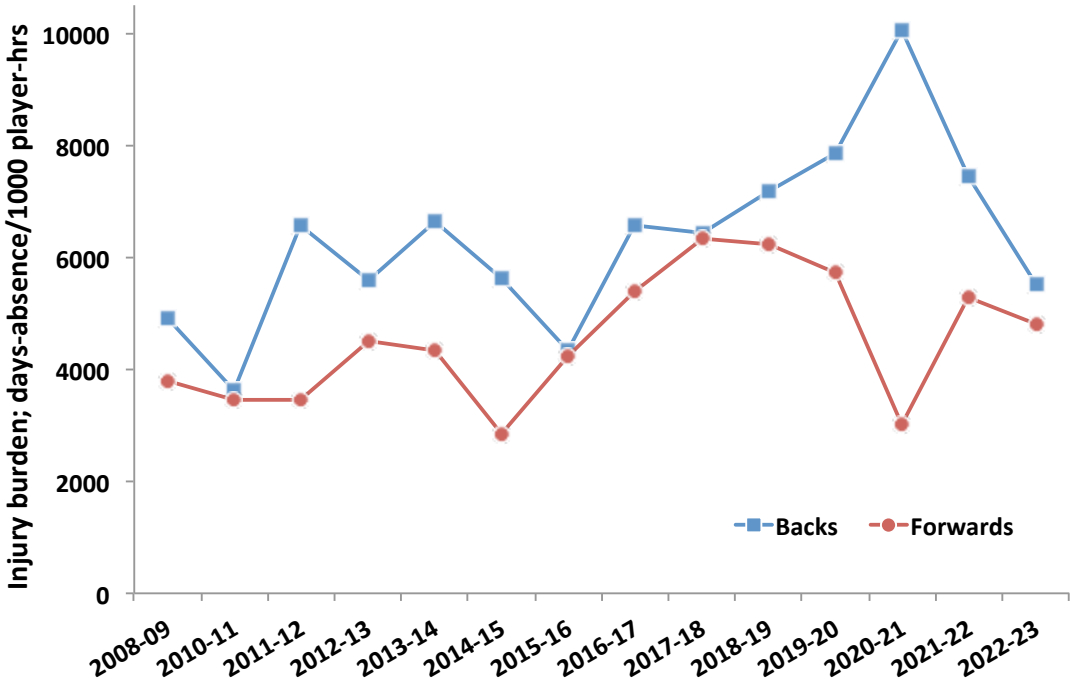

Fig 9. Long-term trends in injury burden for backs and forwards

4.2d Location of injury

Table 4 reports the main and sub-locations of injuries sustained by backs, forwards and all players during the 2022/23 Sevens Series. Lower limb and head/neck were the most common main locations for both backs and forwards. Head/face (24.8%) and knee (14.9%) were the most common sub-locations for backs and head/face (22.9%) and ankle (14.6%) the most common for forwards.

Table 4: Locations of match injuries sustained during the 2022/23 Sevens Series.

Location of injury	% (95% Confidence interval)		
	Backs	***Forwards***	***ALL players***
2022/23			
Head/neck	27.7 (19.0 – 36.4)	25.0 (12.9 – 37.1)	26.8 (19.8 – 33.9)
Head/face	24.8 (16.4 – 33.1)	22.9 (11.1 – 34.7)	24.2 (17.3 – 31.0)
Neck/cerv[l] spine	3.0 (0 – 6.3)	2.1 (0 – 6.1)	2.7 (0.1 – 5.3)
Upper limbs	15.8 (8.8 – 22.9)	22.9 (11.1 – 34.7)	18.1 (12.0 – 24.3)
Shoulder/clavicle	9.9 (4.1 – 15.7)	12.5 (3.2 – 21.8)	10.7 (5.8 – 15.7)
Upper arm	0.0 (-)	0.0 (-)	0.0 (-)
Elbow	0.0 (-)	2.1 (0 – 6.1)	0.7 (0 – 2.0)
Forearm	0.0 (-)	2.1 (0 – 6.1)	0.7 (0 – 2.0)
Wrist/hand	5.9 (1.4 – 10.5)	6.3 (0 – 13.0)	6.0 (2.2 – 9.8)
Trunk	5.9 (1.4 – 10.5)	6.3 (0 – 13.0)	6.0 (2.2 – 9.8)
Ribs/upper back	4.0 (0.2 – 7.7)	4.2 (0 – 9.8)	4.0 (0.9 – 7.2)
Abdomen	0.0 (-)	0.0 (-)	0.0 (-)
Low back	2.0 (0 – 4.7)	0.0 (-)	1.3 (0 – 3.2)
Sacrum/pelvis	0.0 (-)	2.1 (0 – 6.1)	0.7 (0 – 2.0)
Lower limbs	50.5 (40.8 – 60.2)	45.8 (31.9 – 59.8)	49.0 (41.0 – 57.0)
Hip/groin	4.0 (0.2 – 7.7)	0.0 (-)	2.7 (0.1 – 5.3)
Thigh, anterior	2.0 (0 – 4.7)	4.2 (0 – 9.8)	2.7 (0.1 – 5.3)
Thigh, posterior	9.9 (4.1 – 15.7)	4.2 (0 – 9.8)	8.1 (3.7 – 12.4)
Knee	14.9 (8.0 – 21.8)	12.5 (3.2 – 21.8)	14.1 (8.5 – 19.6)
Lower-Leg	5.0 (0.7 – 9.2)	10.4 (1.9 – 19.0)	6.7 (2.7 – 10.7)
Ankle	11.9 (5.6 – 18.2)	14.6 (4.7 – 24.5)	12.8 (7.4 – 18.1)
Foot/toe	3.0 (0 – 6.3)	0.0 (-)	2.0 (0 – 4.3)

The main and sub-locations of injuries, over the period 2008/09 to 2022/23, are shown, as a function of playing position, in Table 5. The most common main locations for injuries sustained by backs over this period were the lower limbs (58.7%) and upper limbs (18.3%), while for forwards they were the lower limbs (53.3%) and head/neck (19.8%). The most common sub-locations for backs over this period were head/face (16.8%) and ankle (15.8%), while for forwards they were head/face (17.9) and knee (15.9%).

Table 5: Locations of match injuries sustained from 2008/09 to 2022/23 Series.

Location of injury	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
All Series (2008/09 – 2022/23)			
Head/neck	18.0 (15.8 – 20.2)	19.8 (16.8 – 22.8)	18.7 (16.9 – 20.4)
Head/face	16.8 (14.7 – 19.0)	17.9 (15.1 – 20.8)	17.2 (15.5 – 18.9)
Neck/cervˡ spine	1.2 (0.5 – 1.8)	1.9 (0.9 – 2.9)	1.4 (0.9 – 2.0)
Upper limbs	18.3 (16.1 -20.5)	19.5 (16.6 – 22.5)	18.7 (17.0 – 20.5)
Shoulder/clavicle	11.4 (9.5 – 13.2)	11.8 (9.4 – 14.3)	11.5 (10.1 – 13.0)
Upper arm	0.7 (0.2 – 1.2)	0.1 (0 -0.4)	0.5 (0.2 – 0.8)
Elbow	1.1 (0.5 – 1.7)	0.9 (0.2 – 1.6)	1.0 (0.6 – 1.5)
Forearm	0.4 (0.1 – 0.8)	0.6 (0.0 – 1.1)	0.5 (0.2 – 0.8)
Wrist/hand	4.7 (3.5 – 5.9)	6.1 (4.3 – 7.8)	5.2 (4.2 – 6.2)
Trunk	5.0 (3.8 – 6.3)	7.4 (5.4 – 9.3)	5.9 (4.8 – 7.0)
Ribs/upper back	2.7 (1.8 – 3.7)	3.9 (2.5 – 5.3)	3.2 (2.4 – 4.0)
Abdomen	0.8 (0.3 – 1.3)	0.9 (0.2 – 1.6)	0.8 (0.4 – 1.2)
Low back	1.0 (0.4 – 1.6)	1.6 (0.7 – 2.5)	1.2 (0.7 – 1.7)
Sacrum/pelvis	0.5 (0.1 – 0.9)	1.0 (0.3 – 1.8)	0.7 (0.3 – 1.1)
Lower limbs	58.7 (55.8 – 61.5)	53.3 (49.6 – 57.0)	56.7 (54.4 – 58.9)
Hip/groin	3.1 (2.1 – 4.1)	2.6 (1.4 – 3.8)	2.9 (2.1 – 3.7)
Thigh, anterior	4.1 (3.0 – 5.2)	5.1 (3.4 – 6.7)	4.5 (3.5 – 5.4)
Thigh, posterior	11.5 (9.7 – 13.4)	6.1 (4.3 – 7.8)	9.5 (8.2 – 10.8)
Knee	15.3 (13.2 – 17.3)	15.9 13.2 – 18.6)	15.5 (13.9 – 17.2)
Lower-Leg	5.9 (4.5 – 7.2)	6.5 (4.7 – 8.3)	6.1 (5.0 – 7.2)
Ankle	15.8 (13.7 – 17.9)	14.5 (11.8 – 17.1)	15.3 (13.7 – 16.9)
Foot/toe	3.0 (2.0 – 4.0)	2.7 (1.5 – 4.0)	2.9 (2.1 – 3.7)

Based on the 95% confidence intervals shown in Table 5, backs sustain significantly more posterior thigh injuries than forwards; there are no other significant differences. Long-term trends in the main injury locations are shown in Figures 10 (backs) and 11 (forwards).

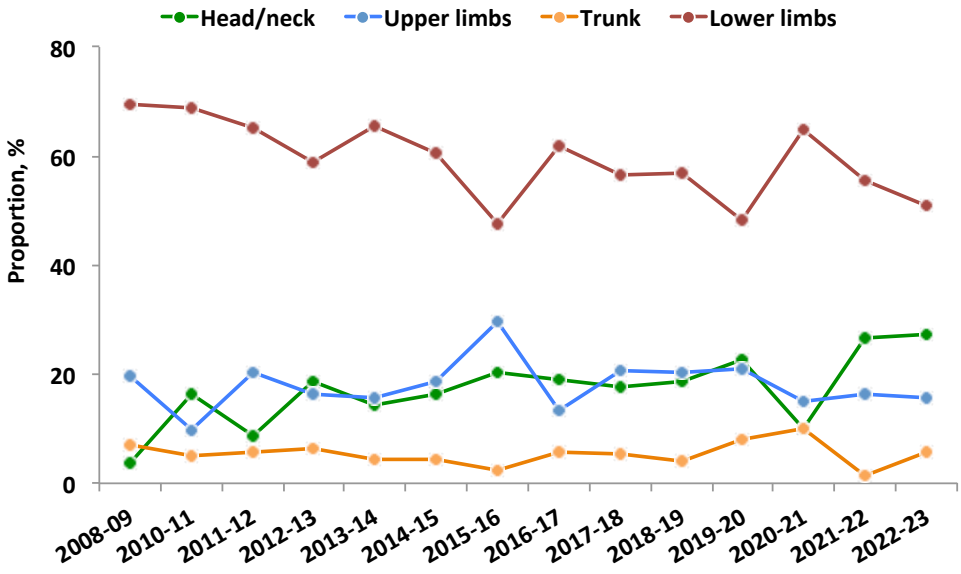

Fig 10. Long-term trends in body locations of match injuries sustained by backs

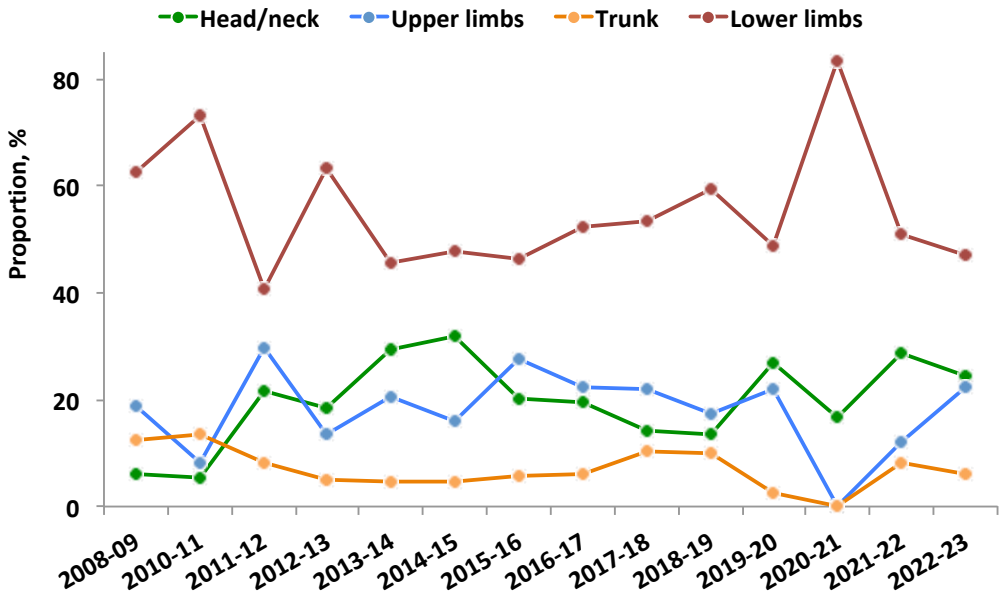

Fig 11. Long-term trends in body locations of match injuries sustained by forwards

4.2e Type of injury

Table 6 reports the main and sub-types of injuries sustained by backs, forwards and all players during the 2022/23 Sevens Series.

During the 2022/23 Sevens Series, joint (non-bone)/ligament and muscle/tendon injuries were the most common main types of injury for both backs and forwards. Sprain/ligament (backs: 33.3%%; forwards: 26.5%) and brain/concussion (backs: 19.6%; forwards: 20.4%) injuries were the most common sub-types for both backs and forwards.

Table 6: Types of match injuries sustained during the 2022/23 Sevens Series.

Type of injury	% (95% Confidence interval)		
	Backs	***Forwards***	***ALL players***
2022/23			
Bone	7.8 (2.6 – 13.1)	14.3 (4.4 – 24.1)	9.9 (5.2 – 14.7)
Fracture	7.8 (2.6 – 13.1)	14.3 (4.4 – 24.1)	12.2 (3.1 – 21.4)
Other bone	0.0 (-)	0.0 (-)	0.0 (-)
C/PNS	19.6 (11.9 – 27.3)	20.4 (9.1 – 31.7)	19.9 (13.5 – 26.2)
Brain/concussion	19.6 (11.9 – 27.3)	20.4 (9.1 – 31.7)	19.9 (13.5 – 26.2)
Nerve injuries	0.0 (-)	0.0 (-)	0.0 (-)
Joint (non-bone)/lig[t]	43.1 (33.5 – 52.7)	32.7 (19.5 – 45.8)	39.7 (31.9 – 47.5)
Dislocation/sublux[n]	3.9 (0.2 – 7.7)	4.1 (0 – 9.6)	4.0 (0.9 – 7.1)
Lesion meniscus	2.9 (0 – 6.2)	2.0 (0 – 6.0)	2.6 (0.1 – 5.2)
Sprain/ligament	33.3 (24.2 – 42.5)	26.5 (14.2 – 38.9)	31.1 (23.7 – 38.5)
Other	2.9 (0 – 6.2)	0.0 (-)	2.0 (0 – 4.2)
Muscle/tendon	27.5 (18.8 – 36.1)	26.5 (14.2 – 38.9)	27.2 (20.1 – 34.2)
Haematoma/etc	9.8 (4.0 – 15.6)	12.2 (3.1 – 21.4)	10.6 (5.7 – 15.5)
Muscle rupture/etc	14.7 (7.8 – 21.6)	12.2 (3.1 – 21.4)	13.9 (8.4 – 19.4)
Tendon injury/etc	2.9 (0 – 6.2)	2.0 (0 – 6.0)	2.6 (0.1 – 5.2)
Other	0.0 (-)	0.0 (-)	0.0 (-)
Skin	2.0 (0 – 4.7)	4.1 (0 – 9.6)	2.6 (0.1 – 5.2)
Abrasion	0.0 (-)	0.0 (-)	0.0 (-)
Laceration	2.0 (0 – 4.7)	4.1 (0 – 9.6)	2.6 (0.1 – 5.2)
Other types	0.0 (-)	2.0 (0 – 6.0)	0.7 (0 – 2.0)
Visceral	0.0 (-)	0.0 (-)	0.0 (-)
Other	0.0 (-)	2.0 (0 – 6.0)	0.7 (0 – 2.0)

C/PNS: Central and peripheral nervous systems

The main and sub-types of injury sustained by backs and forwards, over the period 2008/09 to 2022/23, are shown, as a function of playing position, in Table 7.

The most common types of match injuries sustained by backs over the period 2008/09 to 2022/23 were ligament sprain (30.0%), muscle rupture (18.1%), brain/concussion (14.1%) and haematoma (10.2%) injuries; for forwards they were ligament sprain (30.9%), brain/concussion (14.0%), muscle rupture (12.3%), and haematoma (11.3%) injuries.

Based on the 95% CIs, the only significant difference in injury types sustained by backs and forwards is the higher percentage of muscle strains sustained by backs (18.1%) compared to forwards (12.3%).

Table 7: Types of match injuries sustained from 2008/09 to 2022/23.

Type of injury	% (95% Confidence interval)		
	Backs	***Forwards***	***ALL players***
All Series (2008/09 – 2022/23)			
Bone	8.0 (6.5 – 9.6)	9.8 (7.6 – 12.0)	8.7 (7.4 – 10.0)
Fracture	6.7 (5.3 – 8.2)	8.8 (6.7 – 10.9)	7.5 (6.3 – 8.7)
Other bone	1.3 (0.6 – 1.9)	1.0 (0.3 – 1.8)	1.2 (0.7 – 1.7)
C/PNS	15.2 (13.1 – 17.2)	15.0 (12.3 – 17.7)	15.1 (13.5 – 16.7)
Brain/concussion	14.1 (12.1 – 16.1)	14.0 (11.4 – 16.6)	14.0 (12.5 – 15.6)
Nerve injuries	1.1 (0.5 – 1.7)	1.0 (0.3 – 1.8)	1.1 (0.6 – 1.5)
Joint (non-bone)/lig[t]	42.0 (39.2 – 44.8)	42.4 (38.7 – 46.1)	42.1 (39.9 – 44.4)
Dislocation/sublux[n]	5.6 (4.3 – 7.0)	6.6 (4.8 – 8.5)	6.0 (4.9 – 7.1)
Lesion meniscus	5.9 (4.5 – 7.2)	4.8 (3.2 – 6.3)	5.5 (4.4 – 6.5)
Sprain/ligament	30.0 (27.4 – 32.7)	30.9 (27.4 – 34.3)	30.3 (28.3 – 32.4)
Other	0.4 (0.1 – 0.8)	0.1 (0 – 0.4)	0.3 (0.1 – 0.6)
Muscle/tendon	32.5 (29.8 – 35.2)	28.1 (24.8 – 31.5)	30.9 (28.8 – 33.0)
Haematoma/etc	10.2 (8.4 – 11.9)	11.3 (8.9 – 13.6)	10.6 (9.2 – 12.0)
Muscle rupture/etc	18.1 (15.9 – 20.3)	12.3 (9.8 – 14.7)	15.9 (14.3 – 17.6)
Tendon injury/etc	3.9 (2.8 – 5.0)	4.3 (2.8 – 5.8)	4.1 (3.2 – 5.0)
Other	0.3 (0.0 – 0.7)	0.3 (0 – 0.7)	0.3 (0.1 – 0.6)
Skin	1.3 (0.6 – 1.9)	2.9 (1.6 – 4.1)	1.9 (1.3 – 2.5)
Abrasion	0.0 (-)	0.4 (0 – 0.9)	0.2 (0.0 – 0.3)
Laceration	1.3 (0.6 – 1.9)	2.5 (1.3 – 3.6)	1.7 (1.1 – 2.3)
Other types	1.0 (0.4 – 1.6)	1.7 (0.8 – 2.7)	1.3 (0.8 – 1.8)
Visceral	0.4 (0.1 – 0.8)	0.9 (0.2 – 1.6)	0.6 (0.2 – 0.9)
Other	0.6 (0.2 – 1.0)	0.9 (0.2 – 1.6)	0.7 (0.3 – 1.1)

C/PNS: Central and peripheral nervous systems

Trends in the main types of match injuries sustained over the period 2008/09 to 2022/23 are shown in Figure 12 for backs and Figure 13 for forwards.

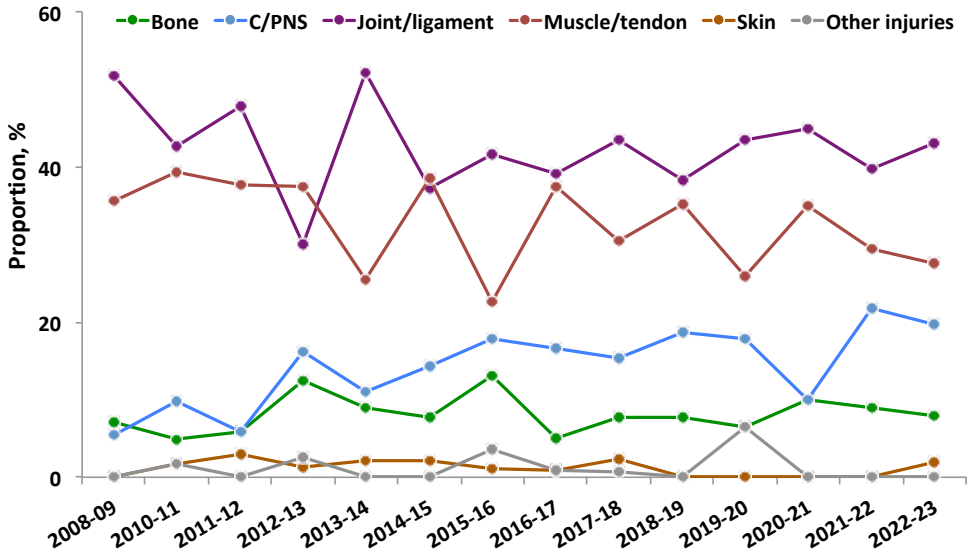

Fig 12. Long-term trends in the main types of match injuries sustained by backs

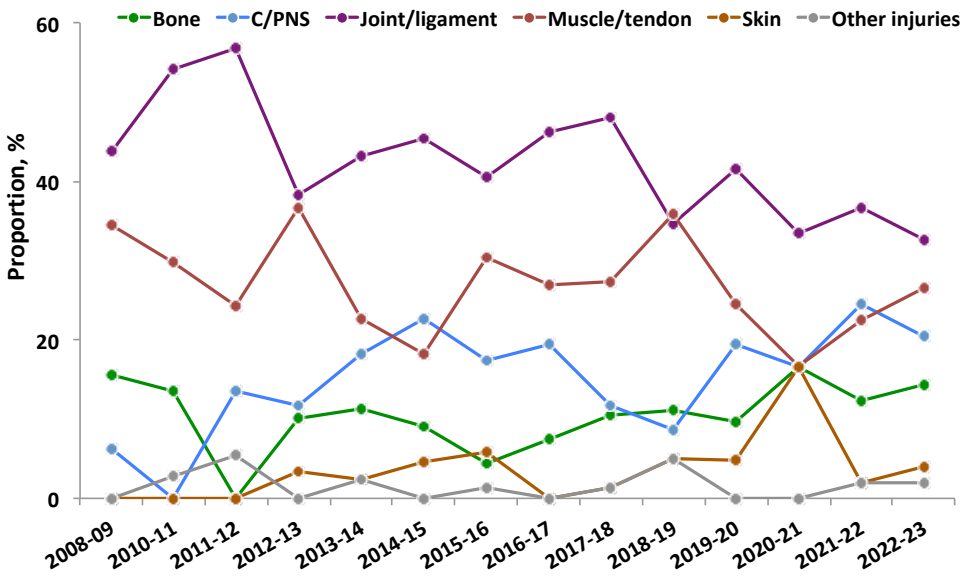

Fig 13. Long-term trends in the main types of match injuries sustained by forwards

Figure 14 shows the increasing trends in the percentage and incidence of brain/concussion injuries sustained in the period from 2008/09 to 2022/23.

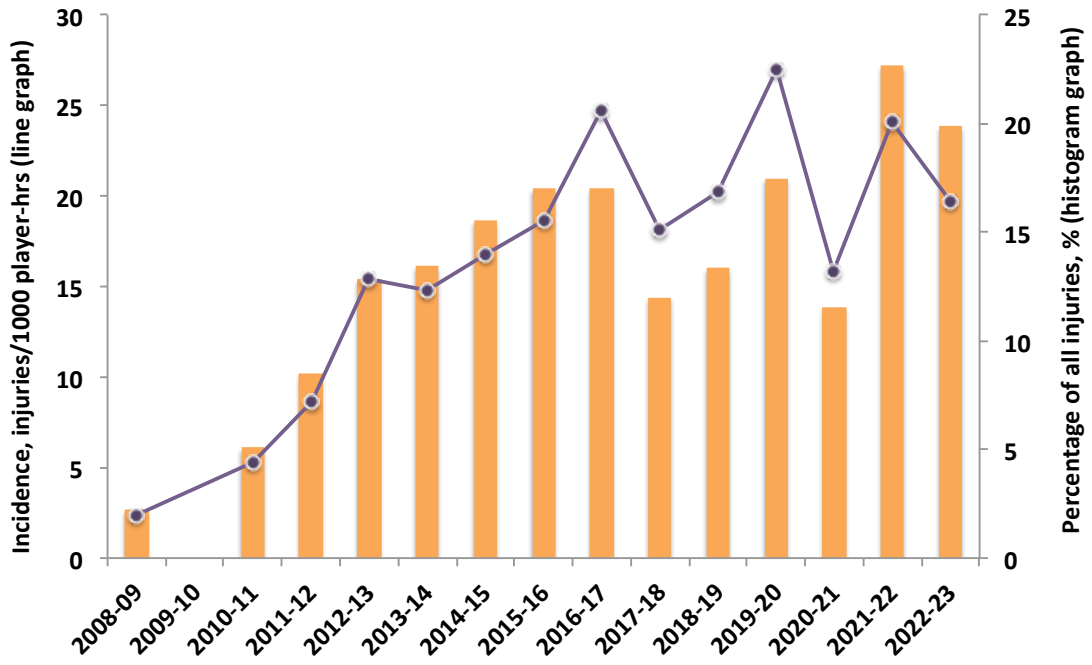

Figure 14: Long-term trend in incidence and percentage of brain injuries (concussion)

4.2f Most common and highest risk injuries

Table 8 lists the six most common injuries and Table 9 lists the six injuries resulting in the greatest time-loss (total days-lost) for backs and forwards over the period 2008/09 to 2022/23.

Table 8: The six most common injuries sustained by backs and forwards from the 2008/09 to 2022/23 Sevens Series (% of all injuries reported).

Backs		***Forwards***	
Injury	*%*	*Injury*	*%*
Brain (concussion) injuries	14.4	Brain (concussion) injuries	14.1
Ankle ligament injuries	12.1	Ankle ligament injuries	11.3
Hamstring muscle strains	11.3	Knee ligament injuries*	7.1
Knee ligament injuries*	7.0	Hamstring muscle strains	5.4
Acromioclavicular joint sprain	4.1	ACL injuries	3.5
Knee cartilage injuries	3.2	Quadriceps haematoma	3.5

*: excluding ACL injuries

The injuries listed in Table 8 represent 52.1% of all match injuries sustained by backs and 44.9% of all match injuries sustained by forwards.

Table 9: The six injuries resulting in the greatest injury burden for backs and forwards from the 2008/09 to 2022/23 Sevens Series (% of total days-lost reported).

Backs		***Forwards***	
Injury	*Injury burden %*	*Injury*	*Injury burden %*
Ankle ligament injuries	12.5	ACL injuries	17.2
Hamstring muscle strains	10.0	Ankle ligament injuries	8.8
ACL injuries	9.9	Knee ligament injuries*	7.2
Knee ligament injuries*	8.3	Shoulder dislocat^{n}/instability	6.9
Shoulder dislocat^{n}/instability	7.0	Brain (concussion) injuries	5.7
Brain (concussion) injuries	5.8	Lower-leg fractures	5.0

*: excluding ACL injuries

The injuries listed in Table 9 represent 53.5% of all days-absence resulting from backs' injuries and 50.8% of all days-absence resulting from forwards' injuries.

4.2g Nature of injury onset

Table 10 summarises the nature of injury-onset (acute, gradual) during the 2022/23 Sevens Series, as a function of playing position, and the average values for the period 2008/09 to 2022/23.

Table 10: Nature of the injury-onset of match injuries: 2022/23 Sevens Series.

Series / Nature of onset	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
2022/23			
Acute	92.2 (86.9 – 97.4)	91.8 (84.2 – 99.5)	92.1 (87.7 – 96.4)
Gradual	7.8 (2.6 – 13.1)	8.2 (0.5 – 15.8)	7.9 (3.6 – 12.3)
All Series (2008/09 – 2022/23)			
Acute	92.0 (90.4 – 93.6)	91.5 (89.4 – 93.6)	91.8 (90.6 – 93.1)
Gradual	8.0 (6.4 – 9.6)	8.5 (6.4 – 10.6)	8.2 (6.9 – 9.4)

Over the period 2008/09 to 2022/23, over 90% of all injuries sustained were acute in nature. There is no statistically significant difference between backs and forwards with respect to the nature of injury onset (p=0.689).

4.2h Cause of injury onset

Table 11 summarises the cause of onset of injury (contact, non-contact) at the 2022/23 Sevens Series, as a function of playing position, and the average values for the period 2008/09 to 2022/23.

Table 11: Cause of onset of injury: 2022/23 Sevens Series.

Series / Cause of onset	*% (95% Confidence interval)*		
	Backs	***Forwards***	***ALL players***
2022/23			
Contact	79.4 (71.3 – 87.4)	84.8 (71.7 – 93.6)	80.4 (73.9 – 86.9)
Non-contact	22.9 (12.6 – 28.7)	1 (6.4 – 28.3)	19.6 (13.1 – 26.1)
All Series (2008/09 – 2022/23)			
Contact	77.1 (74.6 – 79.5)	84.8 (82.1 – 87.5)	79.9 (78.1 – 81.8)
Non-contact	22.9 (20.5 – 25.4)	15.2 (12.5 – 17.9)	20.1 (18.2 – 21.9)

Over the period 2008/09 to 2022/23, eighty per cent of all injuries were sustained as a consequence of contact events. Over this period, backs sustained significantly (p<0.001) more non-contact injuries than forwards, which was mainly the result of the greater number of running injuries sustained by backs (see Table 12 below).

4.2i Match events leading to injury

Table 12 provides a summary of the specific match events leading to injury as a function of playing position over the 2008/09 – 2022/22 Seven Series.

Table 12: Match events leading to injury in the period from 2008/09 – 2022/23.

Series / Cause of onset	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
All Series (2008/09 – 2022/23)			
Collision	10.9 (9.1 – 12.7)	13.5 (10.9 – 16.0)	11.9 (10.4 – 13.4)
Kicking	0.5 (0.1 – 0.9)	0.1 (– 0.4)	0.4 (0.1 – 0.7)
Lineout	0.0 (-)	1.6 (0.7 – 2.6)	0.6 (0.2 – 1.0)
Maul	0.3 (0.0 – 0.6)	0.1 (0 – 0.4)	0.2 (0.0 – 0.4)
Ruck	6.9 (5.4 – 8.4)	8.6 (6.5 – 10.7)	7.6 (6.3 – 8.8)
Running	19.5 (17.2 – 21.8)	11.0 (8.6 – 13.3)	16.3 (14.6 – 18.0)
Scrum	0.0 (-)	1.0 (0.3 – 1.8)	0.4 (0.1 – 0.7)
Tackled	33.3 (30.6 – 36.1)	31.6 (28.1 – 35.1)	32.7 (30.5 – 34.8)
Tackling	23.7 (21.2 – 26.2)	26.9 (23.6 – 30.3)	24.9 (22.9 – 26.9)
Other	4.8 (3.6 – 6.1)	5.4 (3.7 – 7.1)	5.0 (4.0 – 6.0)

Being-tackled (33.3%), tackling (23.7%) and running (19.5%) are the match events responsible for most injuries sustained by backs, while being-tackled (31.6%), tackling (26.9%) and collision (13.5%) are the events responsible for most injuries sustained by forwards. Based on the 95% CIs, apart from the position-specific activities of lineouts and scrums, the higher proportion of running injuries sustained by backs is the only statistically significant difference ($p<0.001$) in the causes of injuries sustained by backs and forwards. This higher proportion of running injuries is reflected in the higher proportion of non-contact injuries sustained by backs (see Table 11 above).

The most common match events leading to brain/concussion injuries for all players are tackling (44.4%), being-tackled (22.6%), collision (20.7%), and ruck (9.6%).

4.2j Time of injury

Based on the all-Series data (2008/09 – 2022/23), Table 13 provides a summary of the period in a match when injury events took place, as a function of playing position.

Table 13: Time during matches when injuries were sustained: 2022/23 Sevens Series.

Series / Time of injury	% (95% Confidence interval)		
	Backs	*Forwards*	*ALL players*
2022/23			
First half	48.0 (38.3 – 57.7)	59.2 (45.4 – 72.9)	51.7 (43.7 – 59.6)
Second half	52.0 (42.3 – 61.7)	40.8 (27.1 – 54.6)	48.3 (40.4 – 56.3)
All Series (2008/09 – 2022/23)			
First half	39.5 (36.7 – 42.3)	40.5 (36.8 – 44.2)	39.9 (37.6 – 42.1)
Second half	60.5 (57.7 – 63.3)	59.5 (55.8 – 63.2)	60.1 (57.9 – 62.4)

The 2022/23 Sevens Series was unusual in that similar numbers of injuries were sustained in both halves of matches. Over the period 2008/09 to 2022/23, there were significantly ($p<0.001$) more injuries sustained in the second half of Sevens Series games compared to the first half for both backs (risk ratio=1.5) and forwards (risk ratio=1.5). A detailed analysis of the time when injuries are sustained during men's Sevens Series tournaments has been published previously (Fuller et al., 2016).

4.2k Removal of injured players from the pitch

During the 2022/23 Sevens Series, 66.9% (95% CI: 59.4 – 74.4%) of injured players were removed from play immediately, 19.2% (95% CI: 12.9 – 25.5%) were removed later in the game and 13.9% (95% CI: 8.4 – 19.4%) remained on the pitch until the end of the game. Based on the all-Series injury data (2008/09 – 2022/23), 53.2% (95% CI: 50.9 – 55.5%) of injured players were removed from play immediately, 24.8% (95% CI: 22.9 – 26.8%) were removed later in the game and 21.9% (95% CI: 20.0 – 23.8%) remained on the pitch until the end of the game.

For players with brain/concussion injuries, 76.7% of players were removed immediately, 16.7% were removed later in the game and 6.7% remained on the pitch until the end of the game during the 2022/23 Sevens Series. Over the period 2008/09 to 2022/23, 72.6% of players diagnosed with a brain/concussion injury were removed immediately, 15.2% were removed later in the game and 12.2% remained on the pitch until the end of the game A detailed analysis of this aspect of the Sevens Series has been published previously (Fuller et al., 2018).

4.3 Training injuries

Eleven training injuries were reported during the 2022/23 tournaments (backs: 6; forwards: 5).

A total of 14,761 player-training hours (backs: 7,660; forwards: 7,100) were recorded during the eleven 2022/23 tournaments. This equates to an overall incidence of training injuries of 0.7 injuries/1000 player-training-hours (95% CI: 0.4 – 1.3) (backs: 0.8; 95% CI: 0.4 – 1.7; forwards: 0.7; 95% CI: 0.3 – 1.7). The difference between backs and forwards was not statistically significant (p=0.859).

The mean severities of training injuries were backs: 16.7 days (95% CI: 8.3 – 25.1) and forwards: 190.4 days (95% CI: 62.7 – 318.1); the very large difference between backs and forwards was statistically significant (p<0.001). This difference was the consequence of 3 ACL injuries sustained by forwards during training activities.

The injury burden values associated with training injuries were backs: 13.1 days-absence/1000 player-hours (95% CI: 5.9 – 29.1) and forwards: 134.1 (95% CI: 55.8 – 322.1). The difference between backs and forwards was statistically significant (p<0.001).

No further analyses were undertaken on the training injuries.

4.4 Illnesses

Seven illnesses were reported during the 2022/23 Sevens Series (backs: 4; forwards: 3). Three of these illnesses were reported as gastrointestinal conditions, 2 as respiratory conditions, and 2 as non-specified conditions. Of the seven illnesses, 6 were contracted at a tournament and 1 while travelling to a tournament.

These 7 illnesses equate to a Series-wide time-loss illness prevalence of 1.9%.

No further analyses of the illnesses were undertaken.

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