The incidence and severity of injuries at the 2011 South African Rugby Union (SARU) Youth Week tournaments

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Abstract

Background. Rugby Union, compared with other popular team sports, presents an above-average risk of injury to players that may increase with age and level of play. Elite schoolboy rugby players have been competing at the South African Rugby Union (SARU) Youth tournaments at the under-13 (CW13), under-16 (GK16) and under-18 (AW18 and CW18) tournaments annually since 1964. The injury epidemiology of these tournaments has yet to be established.

Objectives. To determine the injury incidence densities (IIDs) and severity of SARU Youth Week tournament injuries, if the IID increases with age, and the types of injuries at the different age group levels, in 2011.

Methods. All match-related injuries presenting to the Tournament Doctor during these tournaments were recorded and classified for severity and type, using the injury collection Consensus Statement for Rugby. Injury incidence per 1 000 match hours and 95% confidence intervals were calculated using overall player exposure time.

Results. Match-related IIDs for 'all' (combined: 47.9 injuries/1 000 match hours) and time-loss injuries (combined: 23.1 injuries/1 000 match hours) were not significantly different by age group, despite a strong tendency to indicate differences. The absolute number of injuries per match increased with age. In general, there was a higher proportion of concussions at the GK16, AW18, and CW18 compared with the CW13 tournament(s).

Conclusions. Time-loss IIDs at SARU Youth Weeks are similar to other elite junior rugby data. The absolute number and type/classification of injuries per match may be more informative than IIDs alone for medical planning purposes.

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Introduction

The participation by children and adolescents in organised sport is increasing globally for various reasons, including enjoyment, social interaction and health.[1] However, there is a risk of injury associated with participation in the activity, which varies depending on the type of activity.[2] During organised events involving physical activity an accurate quantification of the risk associated with a particular activity is important to both the participant, the medical support associated with the event, and to injury epidemiologists attempting to provide guidelines to reduce this risk.

Of all popular team sports, Rugby Union (henceforth referred to as 'Rugby') presents an above-average overall risk of injury (69 injuries per 1 000 hours exposure) to the player – greater than that of cricket (2 injuries per 1 000 hours exposure), soccer (28 injuries per 1 000 hours exposure) or even ice hockey (53 injuries per 1 000 hours exposure).[3] The high incidence of injury in Rugby is related to the nature of the game – a field-based team sport, with the match lasting 80 minutes (at senior levels), and characterised by short, intermittent bouts of high-intensity exercise with the 30 players having multiple contact situations throughout the game.[4] Risk of injury may increase with age and level/grade, which could be explained by greater speed,[5,6] increased competitiveness/aggression,[7,8] increased height and weight[9] and increased foul play[8] at higher levels of play. In Rugby League, a faster, but comparable version of Rugby, the incidence of injury may also increase with age, which has been attributed to a higher intensity of play at higher levels.[10]

Rugby is popular globally, with an estimated 96 countries currently participating worldwide,[4,11] and enjoys particular popularity in South Africa with an estimated 400 000 - 500 000 players nationwide.[12] The annual South African Rugby Union (SARU) youth tournaments, which began in 1964, are a showcase of the country's elite schoolboy rugby players at the under-13, under-16 and under-18 (two tournaments) age groups. The best 22 players from each of the country's 14 Rugby

unions (as well as other invited teams, including neighbouring countries Namibia and Zimbabwe), compete for the title of unofficial winner of each tournament. For the under-18 Academy Week and Craven Week (AW18 and CW18) tournaments, there is an additional incentive to be selected for national representative teams. Given the prestige associated with provincial union or national representation in South Africa, these tournaments are played at a high level that is thought to be associated with a high injury incidence, based on the aforementioned literature. Despite this, no accurate injury data have been collected at these tournaments since their inception in 1964.

Therefore, the aim of this study was to investigate the incidence and severity of the 2011 SARU Youth Week tournament injuries, to determine differences, if any, with increasing age. A secondary aim was to explore associated factors in injured players. Through the results of this investigation, it was hoped that injury prevention strategies may be enhanced at these age groups to prevent any unnecessary injuries at future tournaments.

Methods

Written informed consent to analyse the recorded information was provided by the player, or by the player's parent or guardian if the the player was younger than 18 years of age. If, in the former case, the player was unable to sign the form owing to the nature of the injury, verbal consent was received after explaining the nature of the study. All of the injured players' information was recorded on a SARU database and the authors were subsequently granted access to this database for analysis in 2011 by SARU and the UCT Human Research Ethics Committee.

Injury surveillance was conducted on the 1 804 players (82 teams with 22 squad members) at the four SARU Youth Week tournaments: Craven Week under-13 (CW13), Grant Khomo Week under-16 (GK16), Academy Week under-18 (AW18) and Craven Week under-18 (CW18), which took place during June and July 2011. A SARU-appointed tournament doctor (TD) was available at each tournament to assess any injury complaint that a player may have had. All injuries that happened before the official tournament matches were not included in the analyses.

Because of the compact schedule of these tournaments, the non-match training hours contributed relatively little to overall tournament exposure and non-match injuries were therefore not recorded. An injury collection form was designed based on the Consensus Statement for injury surveillance.[10] Demographic information of each injured player, such as the player's team, body height, body weight, age, whether or not the player had medical aid (insurance), and protective gear at the time of the injury, was also collected. Unfortunately, this information was not available for players who were not injured. Exposure time was calculated based on the injury collection consensus statement for Rugby:[13] N_M x P_M x D_M (where is N_M is the number of matches, P_M is the number of players per match, and D_M is the duration of the match in hours). Owing to the fact that the injury surveillance was conducted on all the teams in the tournament, P_M was calculated as 30 (15 players per team) for each match. It was also assumed that there were 30 players for the entire match, thereby ignoring the effects of yellow and red cards on match exposure.[10]

Injury definition

The injury definitions, described in the Rugby injury consensus statement,[13] were adapted to the following to suit the needs of these tournaments: 'Any physical complaint, which was caused by a transfer of energy that exceeded the body's ability to maintain its structural and/or functional integrity, that was sustained by a player during a rugby match and required attention from the SARU Tournament Doctor (TD), irrespective of who decided this'.

Injury severity

Highly qualified paramedics and/or nursing staff were available at all tournament matches and therefore, for a player to consult with a TD, the injury would have to be one that the paramedics/nurses could not deal with. A time-loss injury was an injury (based on the aforementioned definition) that resulted in being absent more than one match in a tournament, or more than one day of normal/planned recreational activities after the tournament.

Injury type

The 'type' of injury categories were collapsed from the original definition for the SARU tournaments so that each injury was classified, according to the TD, as relating to one of the following: concussion, spinal cord, broken bone/fracture, joint/ligament/tendon, muscle, bruise, laceration (including skin abrasion), other, unsure.

Match days

Match days (Ms) are defined as days on which all teams played an official tournament match on the same day. For CW18, when only half the teams played in an alternating fashion for the first four days, one M would span two days to include all the team matches. However, for the purpose of comparing the daily load on the tournament medical staff, a tournament match day (TM) is defined as any day in which official rugby matches were played. A TM could also be a M. These terms should be contrasted to 'rest days' (Rs), on which teams were able to do what they wanted. Exposure was only calculated from Ms, and not Rs.

The recording of information was performed at all tournaments by either JB or SH to reduce internal inconsistencies. Owing to the short duration of these tournaments (4 - 5 days), only a small number of players were injured a second time (n=4) and therefore these second injuries were analysed with the first injuries. It has been suggested that only injuries severe enough to be considered time-loss injuries (see 'Injury definitions') should be reported for uniformity of injury comparisons.[13] However, because of the relatively short duration and corresponding low absolute injury numbers at these tournaments, which would make further analyses and interpretation difficult, 'Medical attention' and 'Unsure' injuries were also reported for this study. Suspected time-loss injuries were followed up either at the tournament or at weekly intervals after the conclusion of the tournament to confirm the severity of injury: when the player was able to return to normal sporting activities or stopped all treatment.

Statistical analyses

Exposure was calculated as the total number of team matches played (varied by tournament, Table 1) multiplied by the number of players per match (30 in each case) multiplied by the match duration in hours (varied by tournament, Table 1).[13] For clarity: when two teams were competing against each other, as occurred for every tournament match, this was considered one team match. Injury incidence densities (IIDs) and corresponding 95% confidence intervals (95% CIs) were calculated for the number of injuries (regardless of whether one person was injured more than once) per 1 000 hours of match play.[14] Incidences, including their 95% CIs, which did not overlap were considered to be significantly different from each other.

Results

Key tournament descriptive information for the four Youth Week tournaments is provided in Table 1. The match duration increased with age, from two 20-minute halves (total match duration = 40 minutes) at under-13 to two 35-minute halves (total match duration = 70 minutes) at under-18 level. Although CW18 was the only five-day tournament, this tournament structure was unique in that only half of the teams (10 teams, five matches) played per day, in an alternating fashion, until the final match day in which all 20 teams competed (10 matches). The other three tournaments (CW13, GK16 and AW18) had each team play every day, with a rest day before the final day of the tournament, in which all teams played. Therefore, CW13 had the greatest number of Ms (*n*=4), while the other tournaments had three. The number of teams at each tournament was also greatest at the under-18 tournaments, although, owing to CW13 having four Ms as opposed to the three in the other tournaments, the youngest age-group tournament also had the second highest number of overall matches. The under-18 tournaments had a greater overall exposure time because of the longer duration of their matches.

In total, there were 1 804 players at risk for 3 945 hours of match injury exposure (exposure based on consensus statement calculations[10]) for all of the SARU Youth Week tournaments (Fig. 1).

Of these players, 185 sustained an injury during a tournament match-related incident and were attended to by the TD. Four players suffered two injuries during the tournaments. Based on the TD's estimation, 91 injuries were considered severe enough to be classified as time-loss injuries. The remaining 98 injuries comprised 87 medical attention injuries and 11 injuries for which the TD was unsure of the diagnoses and the players could not be followed up. The majority (81%) of the 91 estimated time-loss injuries were confirmed telephonically one week after each tournament.

The combined IID of time-loss injuries was 23.1 injuries per 1 000 match hours (95% CIs: 18.3 - 27.8) across all the tournaments, while the overall IID was 47.9 injuries per 1 000 exposure hours (95% CI: 41.1 - 54.7). CW13 had the lowest IID of time-loss injuries (15.3 injuries per 1 000 exposure hours; 95% CI: 6.2 - 24.3), whereas CW18 had the highest IID of time-loss injuries (28.6 injuries per 1 000 exposure hours; 95% CI: 18.3 - 38.8) (Fig. 2).

The overall IID (all injuries), and the IID of time-loss injuries, tended to increase with age, although there were no statistically significant differences between tournaments for either overall or time-loss IIDs.

Injuries per match, injury severity and type

The oldest age-group tournaments (AW18 and CW18) had the highest absolute number of injuries per match (Table 2). These two tournaments also had the highest absolute number of time-loss injuries per match. Among the youngest age group (CW13), muscle injuries accounted for the greatest proportion of injuries, while joint/ligament/tendon injuries were consistently over-represented at the three older age tournaments (GK16, AW18 and CW18). There was a relatively high proportion of lacerations/skin abrasions that led to time loss; two injuries to a mouth (one tongue laceration and one case of multiple tooth loss), three eye-lid lacerations and two deep head wounds.

Medical insurance and protective equipment use

Twenty-four per cent (*n*=41) of the 174 injured players who answered the question had no medical insurance for their injuries. Of the players who suffered a time-loss injury, 22% (*n*=19) reported having no medical insurance. Only 57% (*n*=107) of all injured players were wearing a mouth guard at the time of their injury. Similarly, of the players who suffered a time-loss injury, only 51% (*n*=46) were wearing a mouth guard at the time of their injury.

Discussion

The main finding of this paper was that the IIDs of injuries (overall and time loss) during the SARU Youth Week tournaments did not differ significantly by age in 2011, rejecting our initial hypothesis. However, there was a strong tendency for the absolute number and relative proportion of time-loss injuries to increase with increasing age group (proportion of time loss to all injuries: CW13 – 36%; GK16 – 43%; AW18 – 49%; CW18 – 58%). Haseler *et al.*[15] reported similar time-loss injury incidences in age groups that were comparable with those investigated in the current study and lower than those at elite under-20 level.[16] Overall, muscle and joint/ligament/tendon injuries were the most common types of injuries, which is comparable with the

Table 1. Descriptive details of the four South African Rugby Union (SARU) Youth Week tournaments, 2011

Tournament	Teams (*n*)	Duration (min)	Matches (*n*)	Exposure (hours)	Structure	IID (95% CI)	Time-loss IID (95% CI)
CW13	18	40	36	720	M,M,R,M,M	43.1 (27.9 - 58.2)	15.3 (6.2 - 24.3)
GK16	18	60	27	810	M,M,R,M	45.7 (31.0 - 60.4)	19.8 (10.1 - 29.4)
AW18	26	70	39	1 365	M,M,R,M	50.5 (38.6 - 62.5)	24.9 (16.5 - 33.3)
CW18	20	70	30	1 050	TM,TM,TM, TM,R,M*	49.5 (36.1 - 63.0)	28.6 (18.3 - 38.8)

CW13 = Craven Week under-13; GK16 = Grant Khomo under-16; AW18 = Academy Week under-18; CW18 = Craven Week under-18; M = match day; R = rest day; IID = injury incidence density (injuries/1 000 hours exposure).

* For the first four days, only half of the teams play each day in an alternating fashion, and are therefore represented as tournament match days (TMs). All the teams play on the final day, therefore there are five TDs, one of which is a match day (M) by definition (see Methods section).

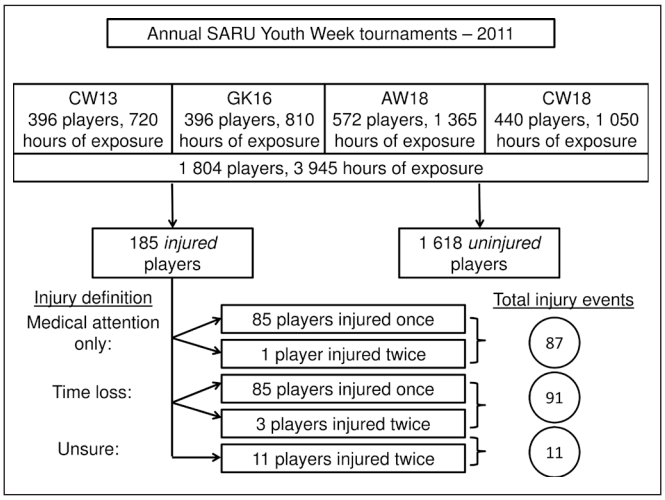

Fig. 1. Flow diagram indicating the number of players injured at the 2011 SARU Youth Weeks according to the injury definitions. The severity of injury was estimated by the tournament doctor (TD) in each case; these were subsequently confirmed telephonically.

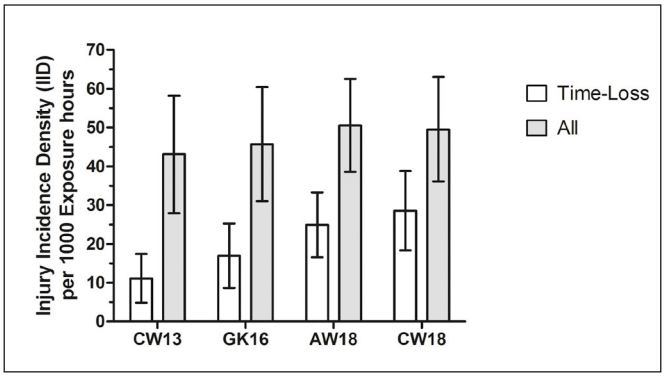

Fig. 2. Incidence (+/- 95% CIs) of time loss (white bars) and all (time loss are included in all) injuries at each South African Rugby Union (SARU) tournament in 2011. CW13 – Craven Week under-13; GK16 – Grant Khomo under-16; AW18 – Academy Week under-18, CW18 – Craven Week under-18.

elite under-20 level previously studied[16] and junior Rugby League,[17] but not community-level junior rugby.[15]

This lack of significant differences between age group IIDs, particularly those of the time-loss injuries, are in contrast to findings consistently reported in the literature. These conflicting reports are from early[5-8] and more contemporary literature,[9,15] collected and reported on using the Consensus Statement for injury surveillance in rugby.[13] Both contemporary studies[9,15] took place over a longer time period (former = three-week tournament; latter = nine-month season) than this study.

Despite the fact that the wearing of mouth guards was highly recommended in the team manager's handbook, only 51% of players who suffered a time-loss injury were wearing a mouth guard at time of their injury. This phenomenon does not appear unique to South Africa as similarly low compliance has been reported in Northern Italy.[18] Although the literature on mouth guard effectiveness in injury prevention is equivocal about concussion,[19] there is evidence to suggest that dental claims can be reduced with improved compliance of mouth guard wearing.[20]

Because of the relatively small number of time-loss injuries in this study, further comparisons between tournaments for positions or phases of play (scrum, ruck, tackle) could not be facilitated, as Knowles *et al.*[14] stated that CIs become inaccurate and therefore of little use to the researcher when calculated on raw data of five or less. However, the proportion of concussions of all time-loss injuries at the tournaments of older groups (GK16, AW18 and CW18) was high and should be focused on in future years.

These youth tournament formats (Table 1) may not be unique internationally and, therefore, raise the question of whether the Consensus Statement,[13] suggested for all rugby injury surveillance studies, should consider broadening the definition of injury that should be reported, particularly for short-format tournaments such as the ones presented in this study. Furthermore, injury incidence densities alone may not have as much practical relevance for prospective medical professionals involved in providing medical support and infrastructure at these type of rugby tournaments. Importantly, this study reports only one year of data collection and therefore may not be a true reflection of these tournaments, emphasising the importance of continued injury surveillance at future SARU tournaments.

Of concern is that 22% of the players who suffered time-loss injuries, had no medical aid cover for the ongoing treatment of their injuries. Although financial situations vary by Rugby Union, all competing teams should attempt to ensure that all their players are covered by medical aid or have some financial support structure in

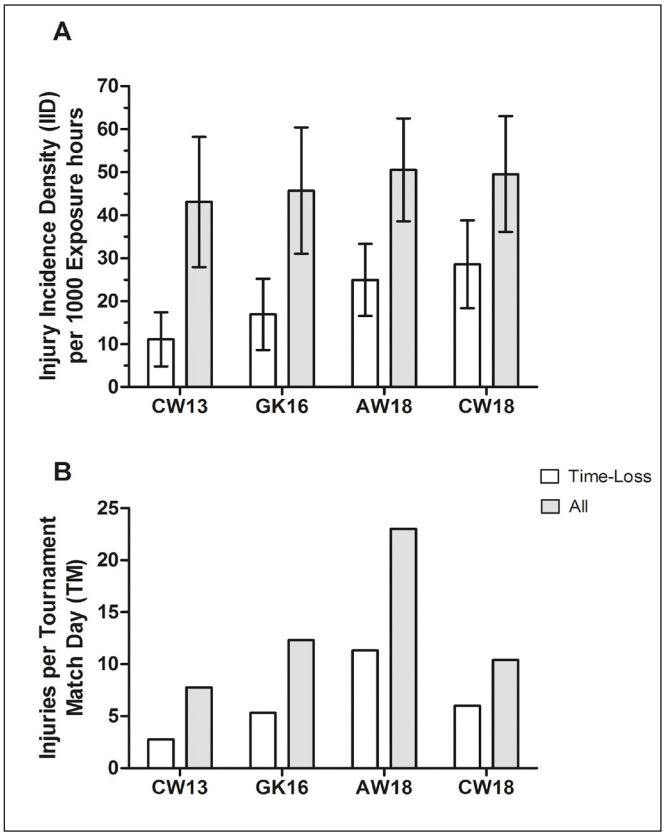

Fig. 3 (A). Injury incidence density (IID) (+/- 95% CIs); and (B): Injuries per match day (M) of all injuries (medical attention, time-loss and unsure) and time-loss injuries only (white area) at each South African Rugby Union (SARU) tournament in 2011. (CW13 – Craven Week under-13; GK16 – Grant Khomo under-16; AW18 – Academy Week under-18; CW18 – Craven Week under-18. Tournament match days - CW13: 4; GK16: 3; AW18: 3; CW18: 5. Note that CW18 has three M, but five actual tournament match days (TM).)

Table 2. Number of injuries per match in South African Rugby Union (SARU) Youth tournaments, 2011. (The number of matches per day is indicated in parentheses after the tournament title. Time-loss (TL) injuries are reported separately and as part of the 'all' injuries category. The proportions of the different types of injuries, as diagnosed by the TD, are shown below the number of injuries per match.)

	CW13 (*n*=9)		GK16 (*n*=9)		AW18 (*n*=13)		CW18 (*n*=5 or 10)*	
Injury severity	TL	All	TL	All	TL	All	TL	All
Injuries per match, *n*	0.3	0.9	0.6	1.4	0.9	1.8	1.0	1.7
Type of injury, %								
Concussion	18	10	38	17	38	19	13	8
Contusion	9	26	6	3	6	13	10	21
Fracture	18	6	6	3	12	6	3	2
Joint/ligament/tendon	18	19	44	31	29	32	47	37
Lacerations†	9	3	0	14	3	9	17	25
Muscle	27	29	6	14	6	16	0	0
Unsure/other	0	6	0	19	6	6	10	8

CW13 = Craven Week under-13; GK16 = Grant Khomo under-16; AW18 = Academy Week under-18; CW18 = Craven Week under-18; All = all injuries; TL = time-loss.
* Tournament structure of CW18 is different to other tournaments in that the final match day has double the amount of matches than the preceding four days. This is explained in detail in the 'Results' section.
† Includes skin abrasions.

place for their participating players in case of a medical emergency, prior to competing in future tournaments.

A limitation of our study was the large reliance on the TD's clinical judgement for diagnosing severity and type of injury at each tournament; this could potentially compromise the level of comparability between tournaments. While all time-loss and 'unsure' injuries were followed up telephonically after the tournament, medical attention injuries were assumed to be accurately defined by the TD. Inaccurate diagnoses could have resulted in under-reporting of time-loss injuries. Secondly, although it would be in direct contrast to SARU's player safety mandate, some teams may have 'hidden' injuries from the TD owing to the short nature of the tournaments. Also, players were less likely to report injuries to the TD on the final day of the tournament as they may have preferred to see their family physician (families on medical aid would not need to pay for these services). Thirdly, the lack of quantification of training time and injuries before and during the tournament was a further limitation, but was logistically difficult to measure.

Practical implications of the current study

The current article could be used as a reference for prospective TDs and support personnel involved in the medical planning and management of future SARU Youth Week tournaments, or any other tournaments with similar, compact structures. IIDs, in isolation, may be misleading for prospective TDs for planning purposes. For example, with reference to Fig. 3A, which displays IIDs, prospective TDs could interpret the medical management loads of the two under-18 tournaments to be comparable. However, Fig. 3B accurately illustrates the greater TM medical burden placed on the AW18 compared with the CW18 TD, despite both teams having the same number of Ms (*n*=3) according to the definition. Despite the same number of Ms and a similar number of injuries per match (Table 2), the CW18 tournament structure is less compacted, has fewer overall teams and therefore less matches than AW18. As the first four days of CW18 only has half the teams participating, this adds to the reduced medical load on the TD. The data presented in the suggested consensus format alone do not accurately guide the infrastructure and personnel requirements for these tournaments. This could have huge practical implications regarding effective planning around budget spend, and medical staffing and infrastructure requirements for these tournaments. Therefore, for medical planning purposes, it is suggested that the data in Tables 1 (daily tournament format) and 2 (injuries per match) are used in combination to determine and cater appropriately for the estimated number, severity and types of injuries per day at each tournament.

The tournament should be planned based on the known absolute number of injuries per match (Table 2), with particular reference to time-loss injuries that tend to require longer treatment and diagnostic times. For example, the recommended assessment and treatment of a concussion using the Sports Concussion Assessment Tool (SCAT2) card[21] takes approximately 30 minutes for the TD to administer properly. With two, or three, concurrent matches being played at the under-18 age groups, the TD would become overwhelmed and would potentially compromise optimal treatment. A simple practical guide for future planning of these tournaments would be to allocate one TD per time-loss injury per match. Therefore, the under-18 tournaments would require one TD per match, while the TDs of the under-13 and under-16 age groups could cope with one TD, with two matches being played concurrently.

Conclusion

The injury incidences of both all and time-loss injuries were not significantly different between age groups at the 2011 SARU tournaments. This finding is contrary to contemporary literature and our initial hypothesis, but is probably explained by the short duration of the SARU tournaments. However, the SARU tournament structures/formats may not be unique, and therefore the consensus statement for injury collection should be adapted to include reporting of a broader definition of injuries. Furthermore, while injury incidences of time-loss injuries may be scientifically comparable, in isolation they may

be misleading from a medical planning or evaluation perspective. Presenting absolute numbers of injuries (both time-loss and medical attention) per match, in conjunction with injury incidences,[13] may satisfy more stakeholders in gaining practical application from injury surveillance reports.

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