Updated definitions and data collection methods for the SA Rugby Injury and Illness Surveillance and Prevention Project *(SARIISPP),* according to the International Olympic Committee (IOC) Consensus Statement of 2020:

DEFINITIONS:

Term:	Old definition:	Discussion about changes:	New definition:
Medical Attention Injury	The injury definitions were based on the Consensus Statement of 2007 for injury reporting in rugby union. All injuries that were seen by the Tournament Medical Doctors were classified as Medical Attention injuries, which are defined by the statement as an "*injury that results in a player receiving medical attention"* (1).	The injury definition is based on the International Olympic Committee Consensus Statement of 2020 (2). Injury can be defined as *"tissue damage or other derangement of normal physical function due to participation in sports, resulting from rapid or repetitive transfer of kinetic energy"*.	All injuries that were seen by the teams' doctor or medical support staff were classified as Medical Attention injuries, which are defined by the 2007 statement as an "*injury that results in a player receiving medical attention*" (1), and by the more recent IOC statement as "*a health problem that results in an athlete receiving medical attention*" (2).

		All injuries that were seen by the Tournament Medical Doctors are classified as Medical Attention injuries which can be defined by the 2007 statement as an "*injury that results in a player receiving medical attention"* (1). Medical Attention health problems are further defined by the consensus statement as, "*A health problem that results in an athlete receiving medical attention"* (2). This can be applied to both injury and illness, whether there is time-loss attached to the health problem or not.	
Time-loss Injury	Medical Attention injuries were further sub-categorised as Time-Loss injuries, where appropriate, which are defined as "*an injury that results in a player being unable to take a full part in future rugby training or match play*". (1)	Medical Attention health problems are further categorized as time-loss health problems, which can be defined as *"A health problem that results in a player being unable to complete the current or future training session or competition."*(2). Specifically, time-loss injuries can be defined by the 2007 statement as, "*an injury that results in a player being unable to take a full part in future rugby training or match play*" (1). This can again be applied to both injury and illness	Medical Attention injuries were further categorised as Time-Loss injuries, where appropriate, and defined by the 2007 statement as, "*an injury that results in a player being unable to take a full part in future rugby training or match play*" (1). The IOC definition is, "*a health problem that results in a player being unable to complete the current or future training session or competition*" (2).

Term:	Old definition:	Discussion about changes:	New definition:
Injury Rate	An injury rate is the number of injuries expressed per 1000 player exposure hours. This normalised version of the number of injuries facilitates comparison between current tournaments, previous tournaments and to other international scientific literature. The injury rate is expressed as a mean with 95% confidence intervals. A 95% confidence interval around a mean value indicates that there is a 95% chance (i.e. very high chance) that the true value falls within this range. The approach of examining the overlap of the 95% CI (Confidence Intervals), is used to determine whether injury incidences are significantly different from each other. If the range of confidence interval values of two comparisons do not overlap, there is a strong chance (95%) that their injury rates are different from each other. This method is conservative and is less likely to produce false positive results (3).	Remains the same with a minor modification for technical accuracy.	An injury rate is the number of injuries expressed per 1000 player exposure hours. This normalised version of the number of injuries facilitates comparison between current tournaments, previous tournaments and to other international scientific literature. The injury rate is expressed as a mean with 95% confidence intervals. A 95% confidence interval around a mean value indicates that we can be 95% certain that the value is bounded by the two intervals. The approach of examining the overlap of the 95% CI (Confidence Intervals), is used to determine whether injury incidences are significantly different from each other. If the range of confidence interval values of two comparisons do not overlap, there is a strong chance that their injury rates are different from each other. This method is conservative and is less likely to produce false positive results (3).

Term:	Old definition:	Discussion about changes:	New definition:
New, Subsequent, and Recurrent injuries	The first injury a player sustained in the tournament, was defined as a '*New Injury'.* Any injury that the *same* player sustained after this initial injury was defined as a *'Subsequent Injury´*. A *'Recurrent Injury'* was any subsequent injury of the same type and to the same site to that which a player had sustained previously.	The first recordable injury that the player sustains in the tournament is defined as an '*Index Injury*'. '*Subsequent Injury'* is defined as '*any injury occurring after the index injury*'. '*Subsequent recurrent injury'* can be defined as a '*subsequent injury to the same site and of the same type as the index injury*'. Subsequent injuries to the same location and tissue as the index injury are '*recurrences'* if the index injury was healed/fully recovered; they are '*exacerbations'* if the index injury was not yet healed/fully recovered (2).	A '*New Injury*' is defined as when a player sustained his first injury. Any injury that the same player sustained after this initial injury was defined as a '*Subsequent Injury´*. According to the more recent IOC statement, any subsequent injury to the same site and of the same type is referred to as a '*Recurrence*' if the index injury was fully recovered before reinjury, and as an '*Exacerbation*' if the index injury was not yet fully recovered (2). To provide more detail on the subsequent injuries for practitioners, we have further categorized the subsequent injuries into one of four groups based on the OSICS classification diagnosis: • Different site - Different type • Different site - Same type • Same site - Different type • Same site – Same type According to the 2007 Consensus Statement for rugby, any subsequent injury classified as '*Same site - Same type'* was a '*Recurrent injury*' (1).

Term:	Old definition:	Discussion about changes:	New definition:
Injury Severity	The total severity of an injury was defined as *"the number of days that have elapsed from the date of injury to the date of the player's return to full participation in team training and availability for match selection"* [1]. Furthermore, severity was grouped into Slight (0-1 days lost), Minimal (2-3 days lost), Mild (4-7 days lost), Moderate (8-28 days lost), Severe (>28 days lost), Career ending and Non-fatal catastrophic [1]. The average severity represents the average number of days lost per injury when dividing the accumulated total number of days lost by the total number of injury events. *For example, a team may have a total severity of 550 days absent, accumulated from 22 injuries. The average severity of the team's injuries would therefore be 550/22, which equals, on average 25 days absent per injury.*	The severity of the health problem can be described as the number of "*Time-Loss*" days and is further defined as "*the number of days that the athlete is unavailable for training and competition, from the date of onset until the athlete is fully available for training and competition.*"(2). The number of time-loss days should be counted from the day after the onset that the athlete is unable to participate (day 1), through the day before the athlete is fully available for training and competition. Furthermore, severity can be separated into the following time bins: 0, 1-7 days, 8-28 days, >28 days, Career ending and Non-fatal catastrophic. '*Catastrophic injury*' as a measure of severity best describes the outcome of permanent disability, which is defined as *"confirmed spinal cord or traumatic brain injury resulting in permanent functional disability".* '*Fatality*' is defined as *"an athlete fatality related to training or competition"* (2). The average severity represents the average number of days lost per injury when dividing the accumulated total number of days lost, by the accumulated total number of injury events recorded.	The total severity of an injury is defined as "*the number of days that the athlete is unavailable for training and competition, from the date of onset until the athlete is fully available for training and competition.*"(2). For each year, at the time of injury the doctors or medical support staff are asked to estimate the severity of the injury based on their clinical assessment of the injured player. These estimations are made according to the severity groupings provided in the 2007 consensus statement; Slight (0-1 days lost), Minimal (2-3 days lost), Mild (4-7 days lost), Moderate (8-28 days lost), Severe (>28 days lost), Career ending and Non-fatal catastrophic (1). To align with the latest IOC statement the injuries have been re-grouped to reflect the severity groupings '*1-7 days*', '*8-28 days*' and '*>28 days*'(2). The average severity represents the average number of days lost per injury when dividing the accumulated total number of days lost by the total number of injury events. For example, a team may have a total severity of 550 days absent, accumulated from 22 injuries. The average severity of the team's injuries would therefore be 550/22, which equals, on average 25 days absent per injury.

		For example, a team may have a total severity of 550 days absent, accumulated from 22 injuries. The average severity of the team's injuries would therefore be 550/22, which equals, on average 25 days absent per injury. A limitation of the average severity calculation is that it may be skewed if there are less than 15 injuries or there are individual injury events resulting in more than 250 days absence. The calculations under these conditions should be interpreted with caution. When there is a case(s) of injuries causing >250 days absence, it is advisable to do the average severity calculation twice; with the case(s) being included and excluded so that the impact these might have on the skewness of the grouped data can be estimated. This will provide the practitioner with a truer indication of what they are dealing with on the ground. <u>Depending on the direction of the scientific paper, the severity of the health problem can also be defined by:</u>	

		The *athlete's self-reported consequences,* which can be defined as '*various patient-rated measures of both health and sports performance',* or economic evaluation, which can be defined as '*clinical extent of illness/injury and societal cost'*(2).	

Term:	Old definition:	Discussion of changes:	New definition:
Injury Burden	Injury burden is a combination of injury rate and injury severity. It is the injury rate multiplied by the average injury severity (*averaged number of days lost due to injury*) and is expressed as the number of days absent per 1000 player hours. *For example, a team who has an injury rate of 75 injuries per 1000 player exposure hours, and an average severity of 38 days lost per injury will have an injury burden of 2850 days absent per 1000 player hours (75 x 38).*	Remains the same. According to the International Olympic Committee Consensus Statement of 2020 there is no single calculation for injury burden. Although it is suggested that for comparison between sports, one should consider reporting the number of days lost per 365 athlete-days for each outcome of interest (2). It can also be visualised using a risk-matrix, in which the incidence of each health problem of interest is plotted against the consequences (such as mean time-loss). See Figure 8, 9 and 11 of The Currie Cup 2019 report (4). Adding curved lines representing 4 points within the matrix where burden is equal is also shown as a useful indicator for interpretation (see Figures 5 and 6 of IOC document)(2).	Injury burden is a combination of injury rate and severity. It is the injury rate multiplied by the average severity (*number of days lost due to injury*) and is expressed as the number of days absent per 1000 player hours. For example, a team who has an injury rate of 75 injuries per 1000 player exposure hours, and an average severity of 38 days lost per injury will have an injury burden of 2850 days absent per 1000 player hours (75 x 38).
Operational Injury Burden	The operational burden is the expected number of days lost per injury per team for every match played over the tournament or season. The measure is an extrapolation of injury rates and severities over a season, and includes the most severe injuries together with the least severe injuries in its estimation.	Stays the same; however the International Olympic Committee Consensus Statement of 2020 recommends that one reports the total number of days lost, and the median and interquartile ranges (2).	The operational burden is the expected number of days lost per injury per team for every match played over the tournament or season. The measure is an extrapolation of injury rates and severities over a season and includes the most severe injuries together with the least severe injuries in its estimation.

	For example, if a team has an operational injury burden of 2 days; it means that based on their injury rates and average severity, on average, 2 days absence or time-loss, can be expected from every match injury the team sustains.		For example, if a team has an operational injury burden of 2 days, it means that based on their injury rates and average severity, on average, 2 days absence can be expected from every match injury the team sustains.

DATA COLLECTION:
RELATIONSHIP TO SPORTS ACTIVITY:

Health problems may occur directly, indirectly or may not be related to participation in the sport:

1. **Directly** refers to an injury occurring "*directly from participation in competition or from training in the fundamental skills of a sport*" (e.g., players colliding in a match, overuse from repetitive training or transmission of a skin infection from contact with another player);

2. **Indirectly** refers to an injury occurring "*from participation in activities that related to competition or training in a sport, but not during competition or a training session*" (e.g., slipping, falling and sustaining an injury when in the Olympic village, developing an illness following international travel to a competition or an illness deemed to be related to an increased training load over a few weeks);

3. **Not at all related to participation in sport** refers to an injury occurring "*from activities that would occur in the absence of participation during competition or training in the fundamental skills of a sport*" (e.g., car crash, sudden cardiac arrest at home more than 24 hours after a match or training session).

MODE OF ONSET:

Table 1. Examples: assessment of mode of onset.

Mechanism:	**Presentation:**	**Example:**
Acute	Sudden onset	(1) A centre pulls up suddenly in a race for the ball, stops and hobbles a few steps in obvious pain with a hamstring injury.
Repetitive	Sudden onset	(2) A lock experiences a frank tibial and fibular fracture on landing awkwardly from a lineout; CT imaging reveals pre-existing morphological changes consistent with bone stress, that is, a stress fracture.
Repetitive	Gradual onset	3) The eighth man experiences gradual increase in shoulder pain over the course of a season; diagnosed as rotator cuff tendinopathy on MRI.

These are the three definitions we are aware of; however, we frequently cluster the repetitive onset injuries together due to the difficulty in distinguishing them from each other during tournaments. If we can differentiate between them, and in those seasonal tournaments that allow us to do so, this will be analysed separately.

REPORTING FREQUENCY:

Frequency or proportion of specific diagnoses or other characteristics. This should always state whether it is expressed as:

- The proportion of all players followed up
- The proportion of all injured players
- The proportion of all reported injuries
- Any combination of the above

CLASSIFYING MECHANISM OF INJURY:

Direct contact mechanisms are referred to as those that "*directly lead to the health problem in an immediate and proximal manner*".

Indirect contact mechanisms are referred to as those that "*stemmed from contact with other athletes or an object. The force is not applied directly to the injured area but contributes to the causal chain leading to the health problem*".

Non-contact mechanisms are referred to as those that *"lead to health problems without any direct or indirect contact from another external source*".

Table 2. Examples: Classification of contact as a mechanism for sudden-onset injury

Injury	**Type of contact**		**Examples**
Non-Contact	None	No evidence of disruption or perturbation of the player's movement pattern	ACL tear in a basketball player landing with knee valgus/rotation after a jump, with no contact with other players. *ACL tear when the ball carrier plants his foot with knee valgus/rotation, while trying to side-step away from an approaching tackler*
Contact	Indirect	Through another athlete	ACL tear in a handball player landing, out of balance after being pushed on her shoulder by an opponent while in the air. *Shoulder dislocation in a rugby player, landing awkwardly while jumping to contest for a high ball kick, and being played in the air*
	Indirect	Through an object	Downhill skier suffers a concussion from a crash, after being knocked off balance hitting the gate with his knee.

Contact	Direct	With another athlete	ACL tear in a football player from a direct tackle to the anterior aspect of the knee, forcing the knee into hyperextension. *The scrumhalf dislocates his AC joint in a tackle, while making direct shoulder contact with the ball carrier's hip.*
	Direct	With an object	Volleyball player being hit in the face by a spiked ball, resulting in a concussion. *Rugby player, while trying to charge the kick down, gets hit in the face by the rugby ball being kicked towards touch by the defending fullback, resulting in a concussion.*

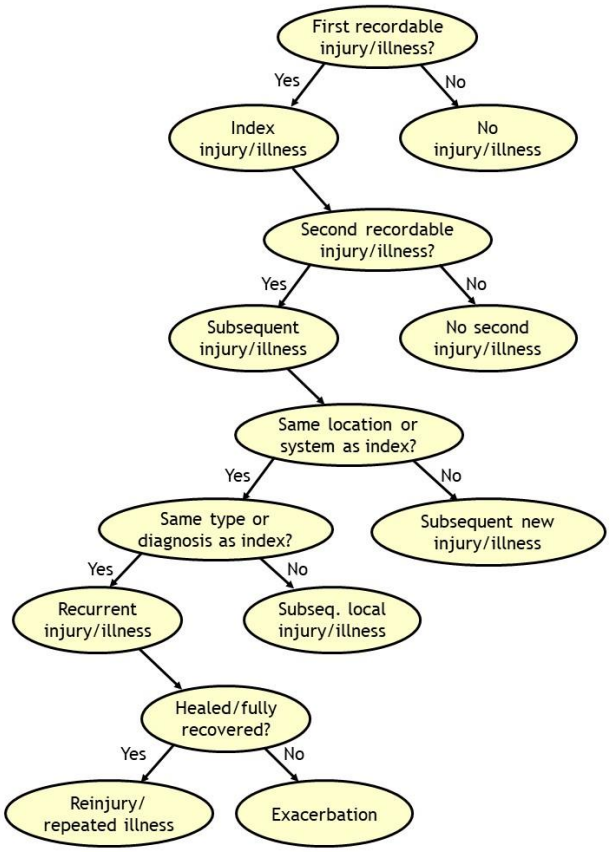

Figure 1. Classification tree for subsequent health problems.

Definitions:
(1) index injury (or illness) = the first recorded injury (or illness),

(2) subsequent injury (or illness) = any injury (or illness) occurring after the index injury (or illness)

(i) subsequent injury to a different location than the index injury (subsequent illness involving a different system than the index illness);

(ii) subsequent injury to the same location but of a different tissue type than the index injury (subsequent illness involving the same system but of a different type/ other diagnosis) or

(iii) subsequent recurrent injury = subsequent injury to the same site and of the same tissue type as the index injury (subsequent illness involving the same system and type as the index illness).

Third (3), fourth (4) or more health problems should be assessed relative to the initial index health problem and all the previous health problems.

Figure 1: explains the process of defining an index injury, subsequent injury and subsequent recurrent injury or an exacerbated injury.

Table 3. Recommendations for key data items that should be collected and reported on in surveillance systems to enable multiple and subsequent injuries/illnesses to be monitored.

Data Items	**Why it is important**
1. Researcher's data collection guide	Researchers need to know how the data were collected. Which medical support staff was involved in the recording - biokineticist, physiotherapist, doctor, researcher, or through observation.
2. Unique identifier to link all injuries/illnesses in one participant	All participants require a unique identifier that covers all seasons/time periods and should be anonymized to protect privacy and confidentiality.
3. The injury/illness time order sequence	The exact date (day, month, year) of onset for each health problem is essential for the sequence to be clear. For greater precision, time can be important if multiple events/heats each day (e.g., swimming/Sevens rugby).
4. Multiple injury/illness type details	Multiple injuries and illnesses can be the result of different or same event or aetiology, coincide at the same time or a mixture of both. Injuries/illnesses need to be linked to the specific circumstances/events that led to them. Date and time stamping, directly linked to diagnoses of all injuries/illnesses can inform these relationships.
5. Injury/illness details, including diagnosis	Collect information on the nature, body region/system, tissue/organ, laterality and diagnosis for all injuries/illnesses. Sport injury/illness diagnostic classification and coding is optimal.
6. Details of circumstances and time elapsed between	The time elapsed between injuries/illnesses will be determined by date and time stamping. If away from participation in sport then it is important to collect details and date/time stamps regarding rest, rehabilitation, treatment, training, modified sport participation and return-to-play.

REPORTING AGGREGATE DATA:

Table 4. Recommended categories of body regions and areas for injuries

Region	Body Area	OSIICS	SMDCS	Notes
Head and Neck	Head	H	HE	Includes facial, brain (concussion), eyes, ears, teeth.
	Neck	N	NE	Includes cervical spine, larynx, major vessels.
Upper Limb	Shoulder	S	SH	Includes clavicle, scapula, rotator cuff, biceps tendon origin.
	Upper arm	U	AR	
	Elbow	E	EL	Ligaments, insertional biceps and triceps tendon.
	Forearm	R	FA	Includes non-articular radius and ulna injuries.
	Wrist	W	WR	Carpus.
	Hand	P	HA	Includes finger, thumb.
Trunk	Chest	C	CH	Sternum, ribs, breast, chest organs.
	Thoracic spine	D	TS	Thoracic spine, costovertebral joints.
	Lumbosacral	L	LS	Includes lumbar spine, sacroiliac joints, sacrum, coccyx, buttocks.
	Abdomen	O	AB	Below diaphragm and above inguinal canal, includes abdominal organs.
Lower limb	Hip/groin	G	HI	Hip and anterior musculoskeletal structures (e.g., pubic symphysis, proximal adductors, iliopsoas).
	Thigh	T	TH	Includes femur, hamstrings (including ischial tuberosity), quadriceps, mid-distal adductors.
	Knee	K	KN	Includes patella, patellar tendon, pes anserinus.
	Lower leg	Q	LE	Includes non-articular tibia and fibular injuries, calf and Achilles tendon.
	Ankle	A	AN	Includes syndesmosis, talocrural and subtalar joints.
	Foot	F	FO	Includes toes, calcaneus, plantar fascia.
Unspecified	Region unspecified	Z	OO	
Multiple regions	Single injury crossing two or more regions	X	OO	

OSIICS, Orchard Sports Injury and Illness Classification System; SMDCS, Sport Medicine Diagnostic Coding System

REPORTING BODY AREA:

When one injury event results in more than one injury the *individual diagnoses* should be recorded and classified separately. For *injury incidence* and *prevalence* reporting purposes they should be counted as one injury and *severity* should be reported as the severity of the most severe injury.

Table 5: Recommended categories of tissue and pathology types for injuries

Tissue	Pathology type	OSIICS	SMDCS	Notes
Muscle/Tendon	Muscle injury	M	10.07-10.09	Includes strain, tear, rupture, intramuscular tendon.
	Muscle contusion	H	10.24	
	Muscle compartment syndrome	Y	10.36	
	Tendinopathy	T	10.28-10.29	Includes paratenon, related bursa, fasciopathy, partial tear, tendon subluxation (all non-rupture), enthesopathy.
	Tendon rupture	R	10.09	Complete/full thickness injury; partial tendon injuries considered to be tendinopathy.
Nervous	Brain/Spinal cord injury	N	20.40	Includes concussion and all forms of brain injury and spinal cord.
	Peripheral nerve injury	N	20.39, 20.41-20.42	Includes neuroma.
Bone	Fracture	F	30.13-30.16, 30.19	Traumatic, includes avulsion fracture, teeth.
	Bone stress injury	S	30.18, 30.32	Includes bone marrow oedema, stress fracture, periostitis.
	Bone contusion	J	30.24	Acute bony traumatic injury without fracture. Osteochondral injuries are considered 'joint cartilage'.
	Avascular necrosis	E	30.35	
	Physis injury	G	30.20	Includes apophysis.
Cartilage/Synovium/Bursa	Cartilage injury	C	40.17, 40.21, 40.37	Includes meniscal, labral injuries and articular cartilage, osteochondral injuries.
	Arthritis	A	40.33-40.34	Post-traumatic osteoarthritis.
	Synovitis/Capsulitis	Q	40.22, 40.34	Includes joint impingement.
	Bursitis	B	40.31	Includes calcific bursitis, traumatic bursitis.
Ligament/Joint capsule	Joint sprain (ligament tear or acute instability episode)	L or D	50.01-50.11	Includes partial and complete tears plus injuries to non-specific ligaments and joint capsule; includes joint dislocations/subluxations.
	Chronic instability	U	50.12	
Superficial tissue/skin	Contusion (superficial)	V	60.24	Contusion, bruise, vascular damage.
	Laceration	K	60.25	
	Abrasion	I	60.26-60.27	
Vessels	Vascular trauma	V	70.45	
Stump	Stump injury	W	91.44	In amputees.
Internal organs	Organ trauma	O	80.46	Includes trauma to any organ (excluding concussion), drowning, relevant for all specialised organs not mentioned elsewhere (lungs, abdominal and pelvic organs, thyroid, breast).

OSIICS, Orchard Sports Injury and Illness Classification System; SMDCS, Sport Medicine Diagnostic Coding System.

Table 6. Data on the injury pattern and burden of specific match injuries among professional rugby teams in New Zealand (2005–2018; unpublished data).

Region	**Injuries**	**Incidence**		**Median time loss**		**Burden**	
Type							
Diagnosis	**N**	**Injuries per 1000 hours (95% CI)**		**Days (95% CI)**		**Time loss days per 1000 hours (95% CI)**	
Head	277	12.9	(11.5 to 14.5)	9	(8 to 10)	325	(317 to 333)
Concussion	204	9.5	(8.3 to 10.9)	10	(9 to 11)	257	(250 to 263)
Neck	60	2.8	(2.2 to 3.6)	8	(6 to 10)	135	(130 to 140)
Shoulder	168	7.8	(6.7 to 9.1)	21	(14 to 27)	628	(618 to 639)
Acute dislocation	15	0.7	(0.4 to 1.1)	209	(27 to 337)	165	(159 to 170)
Haematoma	18	0.8	(0.5 to 1.3)	8	(4 to 13)	25	(23 to 27)
Joint sprain	102	4.8	(3.9 to 5.7)	19	(12 to 25)	292	(284 to 300)
Acromioclavicular joint sprain	54	2.5	(1.9 to 3.3)	14	(10 to 20)	68	(65 to 72)
Glenohumeral joint sprain	48	2.2	(1.7 to 2.9)	30	(14 to 80)	225	(218 to 231)
Upper arm	4	0.2	(0.1 to 0.4)	6	(3 to 133)	7	(6 to 8)
Elbow	27	1.3	(0.9 to 1.8)	9	(5 to 17)	42	(39 to 44)
Forearm	10	0.5	(0.2 to 0.8)	99	(44 to 131)	65	(61 to 68)
Wrist and hand	96	4.5	(3.6 to 5.4)	10	(7 to 27)	194	(188 to 200)
Chest	81	3.8	(3.0 to 4.7)	13	(10 to 16)	75	(71 to 79)
Thoracic spine	6	0.3	(0.1 to 0.6)	5	(3 to 50)	5	(4 to 6)
Lumbar spine	32	1.5	(1.0 to 2.1)	10	(5 to 21)	66	(63 to 70)
Pelvis/Buttock (excluding groin)	6	0.3	(0.1 to 0.6)	12	(5 to 20)	3	(3 to 4)
Hip/groin	40	1.9	(1.4 to 2.5)	9	(6 to 11)	82	(78 to 86)
Thigh	138	6.4	(5.4 to 7.6)	14	(11 to 17)	171	(165 to 176)
Knee	165	7.7	(6.6 to 8.9)	31	(23 to 37)	544	(535 to 554)
Knee cartilage injury	29	1.4	(0.9 to 1.9)	43	(29 to 58)	124	(120 to 129)
Meniscal cartilage injury	22	1.0	(0.7 to 1.5)	44	(28 to 62)	101	(96 to 105)
Knee ligament injury	125	5.8	(4.9 to 6.9)	30	(20 to 37)	390	(382 to 398)
MCL injury	75	3.5	(2.8 to 4.4)	33	(24 to 37)	154	(149 to 159)
ACL injury	9	0.4	(0.2 to 0.8)	275	(70 to 295)	92	(88 to 96)
PCL injury	6	0.3	(0.1 to 0.6)	20	(12 to 218)	23	(21 to 25)
Posterolateral corner and LCL injury	8	0.4	(0.2 to 0.7)	35	(7 to 132)	55	(52 to 58)
Lower leg	100	4.0	(3.2 to 4.9)	17	(14 to 23)	190	(184 to 196)
Ankle	147	6.9	(5.8 to 8.0)	15	(11 to 21)	320	(313 to 328)
Ankle sprain	113	5.3	(4.4 to 6.3)	15	(11 to 21)	228	(222 to 235)
Lateral ligament sprain	46	2.1	(1.6 to 2.8)	15	(9 to 19)	78	(74 to 82)
Syndesmosis sprain	34	1.6	(1.1 to 2.2)	33	(28 to 43)	108	(104 to 112)
Foot	40	1.9	(1.4 to 2.5)	37	(14 to 57)	84	(80 to 88)

LCL, lateral collateral ligament; MCL, medial collateral ligament; PCL, posterior cruciate ligament.

REPORTING CHARACTERISTICS:

Combine region, type and diagnosis in one table as seen in Table 6.

Examples of injury burden visualised by using a risk-matrix:

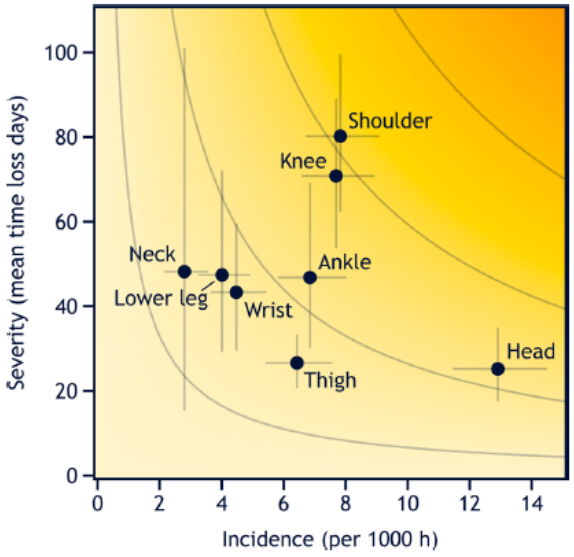

Figure 5 Risk matrix based on the duration of time loss illustrating the burden of match injuries among professional rugby teams in New Zealand between 2005 and 2018 (unpublished data). The darker the yellow, the greater the burden. The curved grey lines represent point with equal burden. The vertical and horizontal error bars represent 95% CIs. See also table 6, illustrating the same dataset in more detail.

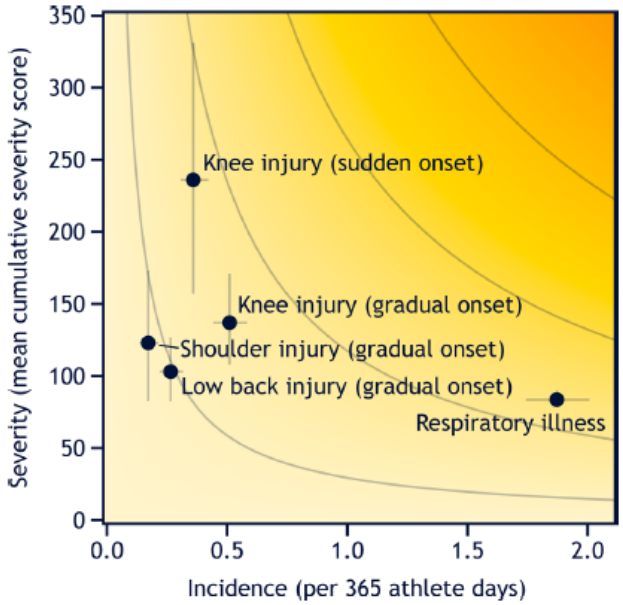

Figure 6 Risk matrix based on Oslo Sports Trauma Research Center Questionnaire on Health Problems severity scores illustrating the burden of injuries and illnesses affecting elite Norwegian endurance athletes (unpublished data). Error bars represent 95% CIs.

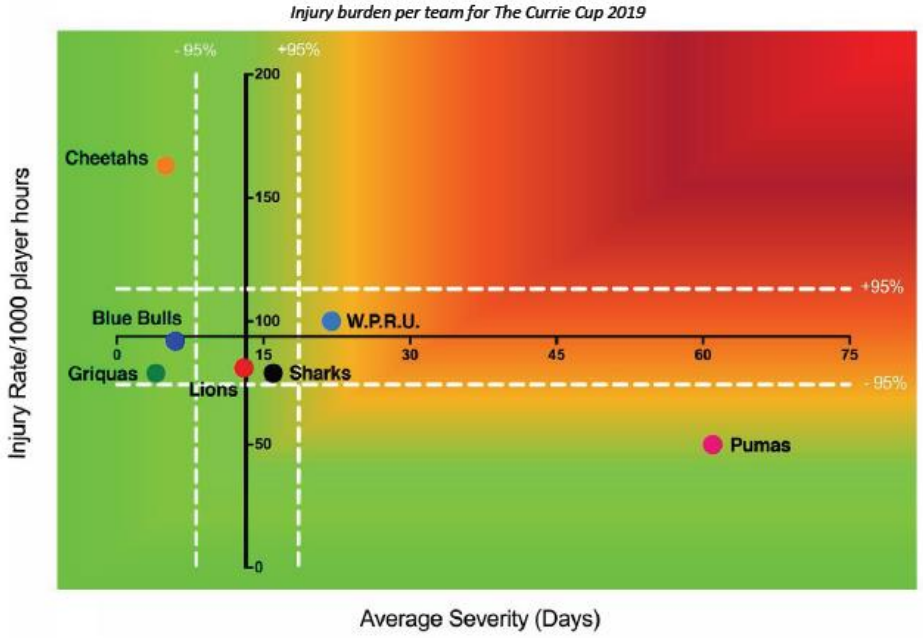

Figure 8: Injury rate plotted against the average severity of Time-Loss injuries for each participating team in The Currie Cup 2019. The Y-axis Average Injury Rate is expressed as the tournament average (±95% CI) and X-axis Average Severity is expressed as the average (±95% CI) of the individual injury severities in the tournament.

Burden of most common injury types for The Currie Cup 2016 - 2019

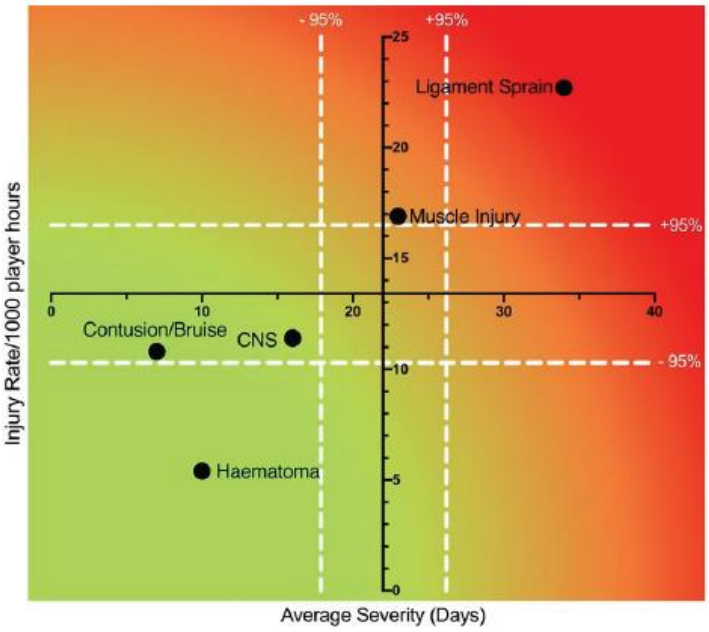

Figure 9: Injury rate plotted against the average severity of the most common Time-Loss injury types combined for 2016 to 2019. The Y-axis Average Injury Rate is expressed as the combined average for the plotted injuries (±95% CI) and X-axis Average Severity is expressed as the average of the individual injury severities for the plotted injuries (±95% CI).

Burden of most commonly injured body locations for The Currie Cup 2016 - 2019

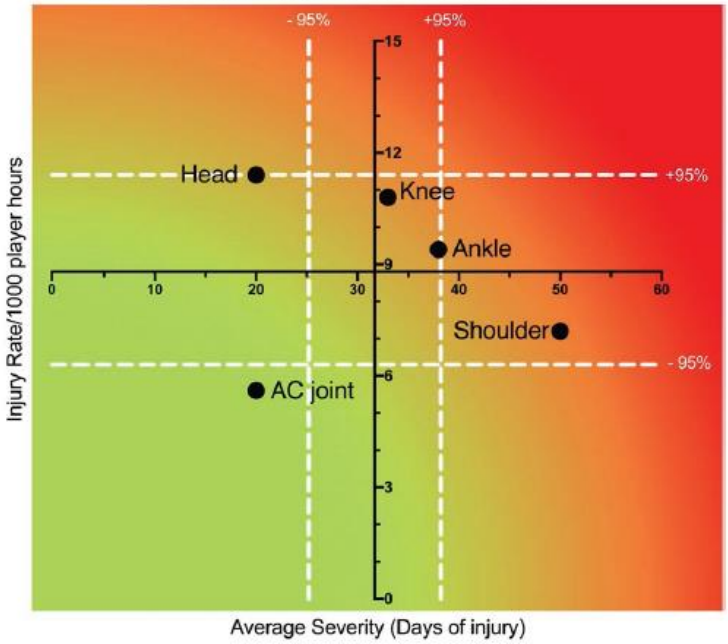

Figure 11: Injury rate plotted against the average severity of the most common body locations of Time-Loss injuries combined for 2016 to 2019. The Y-axis Average Injury Rate is expressed as the combined average for the plotted injuries (±95% CI) and X-axis Average Severity is expressed as the average of the individual injury severities for the plotted injuries (±95% CI).

SEVERITY OF HEALTH PROBLEMS:

The number of time-loss days should be counted from the day after the onset that the athlete is unable to participate (day 1), through the day before the athlete is fully available for training and competition. Cases where an athlete does not complete a competition or training session, but returns on the same or following day, should be recorded as 0 days of time loss. If an athlete recovers from health problems during a period where there is no planned training or competition, the date when the athlete would have returned to full training or competition should be recorded.

Severity categories should include the following time bins: 0, 1–7 days, 8–28 days and >28 days. >28 days can be further subdivided into 4-12 weeks, 3-6 months, >6 months, ≤250 days and >250 days.

Table 7. An example of calculation of time loss.

Case	**Time loss (days)**
A recreational level rugby player injures his shoulder during a match on a Saturday. His shoulder is stiff and painful for 2 days following the match (Sunday and Monday). The team only trains once per week, every Thursday, but the player feels he would have been able to train normally had training been on Tuesday instead	2

If an athlete has multiple injuries, the injury severity should be based on the injury that leads to the longest time loss. (e.g., if rugby players is tackled simultaneously by two players and suffers two injuries, a concussion which takes 19 days to resolve and a tibia fracture which takes 120 days, time loss for the event is 120 days).

Multiday events:

The International Olympic Committee Consensus Statement of 2020 for cases that were not closed by a return-to-play date at the time of the end of the event or season recommends that:

1. If the researcher can liaise with team medical staff and record the actual date of return-to-play, this information should be captured. Collecting actual dates is recommended.
2. If this is not possible, then team medical staff should be asked to provide an estimate of when the athlete is expected to return-to-play. In such case, this information should be clearly *labelled* as an estimated severity.

If this is not possible, then event medical staff should record the date that the athlete leaves the tournament, that is, the last date on which the athlete was seen with the *unclosed* health problem. In such cases, the information should clearly be labelled as a *right-censored injury duration* (a statistical term for situations in which only a portion of the time loss can be observed).

In future reports it must be clearly stated if the days missed were estimated, right-censored injury duration or actual.

Recording severity based on clinical assessment:

Degree and urgency of medical attention:

The severity of an injury or illness can also be recorded based on the degree and urgency of medical attention received by the athlete.

Permanent disability and death:

All injuries leading to permanent disability or death that occur during the period of data collection should be reported separately as Career-ending, Non-fatal catastrophic and Fatal. Career-ending injuries can also be recorded with no permanent disability involved.

Specific definitions:

- *Catastrophic injury* refers to a confirmed spinal cord or traumatic brain injury resulting in permanent functional disability (using American Spinal Injury Association (ASIA scale) and assessed at 12 months).
    - This does not include injuries resulting in transient neurological deficits such as burners/stingers, paraesthesia, transient quadriplegia or cases of concussion where there is full recovery.
    - The term catastrophic event has also been extended to include non-injury events that are life-threatening, such as sport-related sudden cardiac arrest and exertional heatstroke; more detailed recommendations on this issue are provided in the consensus statement on mass community-based endurance sports events.
- *Fatality:* any athlete fatality related to training or competition.
    - When fatalities occur months or years after the event, researchers should justify the relationship to training/competition.

EXPOSURE TO RISK OF INJURY:

Exposure should be recorded separately between competition and training. Recording exposure for *each player* is recommended rather than estimating the number of matches the team plays and their match durations. Results can then be summed to report exposure at the team level.

Competition can be defined as organized scheduled play between opposing athletes or teams of athletes, or athlete(s) competing (i) against time and/or (ii) to obtain a score (judged or measured).

Training can be defined as physical activities performed by the athlete that are aimed at maintaining or improving their skills, physical condition and/or performance in their sport.

Recording exposure over a couple of days:

Acceptable exposure estimates for tournaments can be obtained through summary data of every team. As a minimum standard, exposure can be estimated for each event by multiplying the number of registered athletes by the duration of the tournament (the number of days of competition). This approach does assume all players have the same exposure and participation every day.

Training subcategories

Different types of training should be reported separately (if possible).

Training types can be categorized as follows:

1. Sport-specific training, referring to "*sessions involving the techniques and/or tactics of the sport, usually supervised by a coach.*"
2. Strength and conditioning, referring to "*sessions solely composed of resistance training and/or conditioning training. In many cases, training sessions are mixed (sports-specific, but with addition of some strength and conditioning, e.g., plyometrics, endurance)*".
    a. Any session containing sports-specific training should be categorised as such, even if the session includes some strength and conditioning.
3. Other training sessions, referring to "*sessions that include activities other than sport-specific training or strength and conditioning. These include recovery sessions (e.g., low-intensity running and stretching), rehabilitation and post rehabilitation transition sessions (i.e., post return-to-sport but prior to resuming normal training)*."

Sport-specific injury surveillance systems may need to deviate from these categories if there is a need to address a specific training concern.

EXPRESSING RISK:

Rates and proportions:

Prevalence refers to how many. Prevalence is a proportion and can be calculated by the number of existing cases divided by the total population at risk at a given point in time (point prevalence, e.g., the proportion (percentage) of players in a rugby team who—today— are suffering from patellar tendinopathy).

It can also be a snapshot at one point in time. It can also be repeated to determine changes in prevalence over time (e.g., weekly). Average prevalence over the course of the season can also be calculated and can further compare different stages of the season.

Period prevalence extends the concept of a single point in time to a window of time (e.g., one season, a year). It refers to the proportion of rugby players that have reported the condition of interest (e.g., patellar tendinopathy) at any time during that given window. Notably, this includes people who already had the condition at the start of the study period as well as those who acquired it during that period.

Incidence refers to how often 'new cases' occur. Incidence is a rate and refers to the number of new injuries/illnesses in the population, that develops during a defined period.

Note that prevalence is calculated based on the number of rugby players with a health problem, while incidence refers to the number of new health problems.

Attached are Appendix 1, Table 1 and 2 from the International Olympic Committee Consensus Statement of 2020 for definitions and calculations related to rugby.

Team exposure report:

According to Fuller et al, (2007), the total match exposure time of players in hours for a team can be calculated by (NM x PM x DM)/60, where NM is the number of matches played, PM is the number of players in the team (normally 15) and DM is the duration of a rugby match in minutes (normally 80 min in adult rugby) (1).

Injury rates per events:

Injury rates reported on a per-event (e.g., per rugby tackle) basis can be used to provide information about how likely this event will cause injury. Using time-based and event-based denominators (e.g., tackles in football codes) in parallel can help provide insights into both, which event (e.g., tackle type) is most frequently associated with injuries and which event carries the highest risk when it occurs. (Appendix 1, Table 2)

According to Fuller et al, (2007), injuries should be grouped into quarters if match time is recorded. E.g. in an adult rugby match, First half: 0–20 (first quarter), 21–40+ (second quarter); second half: 41–60 (third quarter), 61–80+ min (fourth quarter) (1).

For stakeholders:

1. Expressing the injury incidence based on the concerned sport's specifications.

   Example: if an injury incidence for a specific muscle group (e.g., hamstrings) is expressed as 0.9 injuries per 1000 hours of exposure, the incidence per player per season (0.28 injuries per player per season) could be multiplied by the average number of athletes per squad for the concerned sport (e.g., 25 in football).

   This gives seven hamstring injuries per squad per season, a quantity which is more easily interpreted by end-users.

2. Player match *availability* is calculated as the sum of player match opportunities (i.e., the number of matches multiplied by the full size of the squad) minus the sum of player match absences due to injury or illness, and can be expressed as the average percentage over the period of interest (e.g., one season).

3. Training availability can be calculated in the same way.

STUDY POPULATION CHARACTERISTICS:

Should only include age, sex, and level of competition. Performance and training level should be explained.

CLASSIFICATION OF SPORT CATEGORIES

Any sports classification system used in surveillance should be clearly described in the methods section of reports.

REPORTING GUIDELINES:

Follow adapted STROBE checklist for future studies. Attached is Appendix 3.

FINAL NOTE FOR CLARITY AND REFERENCE:

This is a working document, which tracks the previously used research protocols for the SA Rugby Injury and Illness Surveillance and Prevention Project (SARIISPP), and aligns them with the new, updated and current international expert consensus protocols available at the time, but with a few additional guidelines, which are applicable to SARU and the BokSmart programme.

References:

1. Fuller CW, Molloy MG, Bagate C, Bahr R, Brooks JHM, Donson H, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. Br J Sports Med. 2007;41(5):328–31.
2. Bahr R, Clarsen B, Derman W, Dvorak J, Emery CA, Finch CF, et al. International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury and illness in sport 2020 (including STROBE Extension for Sport Injury and Illness Surveillance (STROBE-SIIS)). Br J Sports Med [Internet]. 2020;bjsports-2019-101969. Available from: http://bjsm.bmj.com/lookup/doi/10.1136/bjsports-2019-101969
3. Schenker N, Gentleman JF. On judging the significance of differences by examining the overlap between confidence intervals. Am Stat. 2001;55(3):182–6.
4. Starling L, Readhead C, Viljoen W, Lambert M. The Currie Cup Premiership Competition Injury Surveillance Report 2019. South African J Sport Med. 2020;32(1):1–43.

Appendix 1: Case study: Tackle injuries to ball carriers in rugby

The data set

A study was conducted in which video records of every tackle that occurred in 434 professional rugby matches was coded on a range of dimensions, including the location on the body at which the tackler(s) contacted the ball carrier ('tackle height').[1] The information in the table has been restricted to that from 43 366 tackles in which a single tackler tackled a ball carrier (i.e. the 100 tackle events per match that met this criteria). For the purposes of the example below, an injury is defined as 'any injury sustained by a ball carrier during a rugby tackle that required them to be removed from the field of play for the remainder of the match'.

Different denominators: different perspectives on risk

Rates of injury have been presented in Table 1 as 'per 10 000 tackles' and 'per 10 000 player-hours'. If data were reported using only the time-based denominator, as has been the case in most studies of sports injury epidemiology, the conclusion drawn would be that 'high' and 'middle' tackles are those that carry the greatest risk to ball carriers. When the relative frequency of the tackles is considered, and the rates are presented on a 'per 10 000 tackles' basis, head/neck tackles place ball carriers at the greatest risk of injury *when they occur*.

Table 1 Injury rates to ball carriers in rugby tackles, expressed via event-based and time-based denominators.

		Injuries requiring the player to be removed from the match		
Tackle height	**Tackles per match**	**Per 10 000 tackles**	**Per 10 000 player-hours**	**Percent of injuries per 10 000 player hours**
Head/neck	4 ± 2	43 (23 to 79)	4 (2 to 8)	13 (7 to 23)
High	37 ± 10	12 (8 to 17)	11 (8 to 16)	36 (26 to 47)
Middle	44 ± 9	9 (6 to 13)	10 (7 to 15)	32 (23 to 43)
Low	15 ± 5	16 (9 to 26)	6 (3 to 10)	19 (12 to 29)

The different perspectives provided by 'per-event' and 'per-time' denominators can be helpful in identifying injury prevention priorities. If the overall risk of injuries was considered 'unacceptably high' by those responsible for managing the risks in the sport, then reducing the numbers of the most

Bahr R, *et al. Br J Sports Med* 2020;0:1–18. doi: 10.1136/bjsports-2019-101969

common tackles in the game would have the greatest effect; together 'high' and 'middle' tackles account for over two-thirds of all tackle injuries requiring ball carriers to be removed from the pitch. Reducing the numbers of such tackles, or the characteristics of them, would probably require major changes to the sport of rugby. If, however, the overall degree of risk was considered 'acceptable', then focussing on decreasing the number of 'head and neck' tackles would have a modest effect on overall injury rates, but reduce the occurrence of a particularly risky element of the sport (note: head/neck tackles are not permitted within the laws of rugby, but sometimes occur).

The type of exposure measures that can form the basis of risk statistics is presented in Table 2, along with a range of the risk measures that have been reported in studies of team sports injury epidemiology. The examples are taken from the same study discussed above.

Bahr R, *et al. Br J Sports Med* 2020;0:1–18. doi: 10.1136/bjsports-2019-101969

Table 2 A range of exposure and risk statistics derived from injury surveillance data - examples from a study of rugby tackle injuries.[1]

Statistic	Value	Calculation	Explanation	Comment
Injury statistics				
Number of injuries (carrier injury replacements in 434 matches)	53	Nil	Count of the number of tackler injuries requiring the injured player to be replaced observed in 434 matches.	The 'numerator' used for calculating the rate of tackler replacement injuries per unit of time or per tackle. Absolute numbers and costs of injuries *are* of interest to risk managers, especially when provided in parallel with rates
Number of injured players (some were injured more than once)	48	Nil		The numerator for calculating 'injury risk'
Exposure measures				
Player hours in 434 matches	17 360	30*579	Thirty players (15 from each team) multiplied by 579 (hours of play in 434 matches of 80 minutes duration)	This number provides a 'time-window' denominator. Usually it is assumed that time lost for yellow and red cards, or time gained for 'extra time' is negligible and is ignored.
Number of single tackler tackle events in 434 matches	43 366	Nil	All tackles in 434 matches were coded, regardless of whether they resulted in injury	This number forms an 'event-based' denominator.

Bahr R, *et al. Br J Sports Med* 2020;0:1–18. doi: 10.1136/bjsports-2019-101969

Statistic	Value	Calculation	Explanation	Comment
Number of players who appeared in the 434 matches	1403	Nil		This is a count of the size of the cohort across the entire study period; it is used as the denominator for calculating 'injury risk'.
Number of full player matches	13 020	30*434	Thirty players (15 from each team) multiplied by 434 matches	This number provides a 'per-match' denominator.
Number of athlete-exposures (athlete-participations)	17 685	Nil	Count of the number of players who took the field over 434 matches (players can be substituted for tactical purposes or replaced due to injury)	The similarity to the number of player hours is coincidental; there are 40 hours of player-time per match, and the average number of athlete exposures per match over this series of matches was 40.8.
Risk measures				
Period prevalence (percentage of cohort injured)	3%	(48/1403)*100	Percentage of people who appeared in matches who were replaced	Often reported as 'risk per season' or 'risk per year'. Can't be easily used to compare between activities if the duration of surveillance varies from activity to activity. The longer the surveillance period, the higher the risk will appear to be for closed cohorts
Injuries per 1 000 player-hours	3.1	(53/17 360)*1 000	The number of injuries is divided by the number of hours of player exposure, and multiplied by a scaling factor (e.g. 1 000, 10 000) to provide a rate that is convenient to work with (e.g. numbers in the range of 1	The most commonly reported metric of injury rates in studies of rugby injury epidemiology has been rate of injuries per 1 000 player-hours. This convention is endorsed in the consensus document by Fuller et al.[2]

Statistic	Value	Calculation	Explanation	Comment
			to 1 000 rather than numbers less than zero or greater than 1 000	It is relatively simple to estimate based on the number of matches played. Comparisons of incidence rates between activities or within activities over time based on this denominator require the assumption that the number and characteristics of energy transfers to which participants are exposed remains relatively constant per unit of exposure time.
Injuries per 1 000 matches	122	(53/434)*1 000	Rate of tackler replacements per rugby union match multiplied by 1 000. The rate per match is multiplied by a factor that provides a convenient interpretation; 0.12 carrier replacement injuries per match; 12.2 per 100 matches, 122 per 1 000 matches etc.	Ignores number of players and match duration, and provides an estimate of the number of injuries an observer would expect to see if they watched 1 000 matches. Not useful for comparing incidence rates between activities of differing durations or numbers of participants.
Injuries per 1 000 hours of play (ignoring number of players)	92	(53/579)*1 000	The rate per hour is multiplied by a factor that provides a convenient interpretation; 0.9 carrier replacement injuries per hour; 9.2 per 100 hours, 92 per 1 000 hours etc.	Ignores number of players, and provides an estimate of the number of injuries an observer would expect to see if they watched 1 000 hours of play. Not useful for comparing between activities with differing numbers of participants (because the sizes of the populations at risk differ)
Injuries per 1 000 athlete-exposures	3.0	(53/17685)*1 000	Carrier injury replacements per 1 000 athlete exposures	Injuries per 1 000 athlete exposures are commonly reported in injury surveillance in the United States. Problematic for comparing between activities that

Statistic	Value	Calculation	Explanation	Comment
(athlete-participations)				have different numbers of typical athlete exposures per match, or when the average exposure time per player changes over time.
Injuries per 1 000 full player matches	4.1	(53/13020)*1 000		Not commonly used. It ignores the duration of the match, and as such has similar drawbacks to reporting injuries per athlete exposure, because the time-window of exposure varies between activities of different durations.
Injuries per 1 000 'ball in play' player-hours	6.8	(53/7740)*1 000		Not commonly used, but technically a more accurate measure of exposure than injuries per 1 000 player-hours, because players are only exposed to tackles when the ball is ‘in play’.
Injuries per 1 000 'ball in play and ball-carrier’s team in possession' player-hours	13.5	(53/3819)*1 000		Again, not commonly used, but an even closer approximation of actual time exposed to the risk of ball carrier injuries. Players are only tackled when the ball is in play and their team is in possession.
Injuries per 1 000 tackle events	1.2	(53/43366)*1 000	Ball-carrier injury replacements per 1 000 times tackled	Provides an accurate assessment of per-event injury rates, but in isolation ignores frequency of occurrence of the event of interest. Injury rates per event have been sometimes been termed ‘injury propensity’.[3]

Statistic	Value	Calculation	Explanation	Comment
Injuries per 1 000 players per year	24	(23+17+13)*1 000/ (983+589+627)		Sometimes provided as a gross estimate of injury risk when participant numbers and injury numbers are available, but no measure of exposure for players is available (e.g. data derived from insurance claims combined with registers of participants). Of limited use when exposure varies by subgroup or across sports.

References

1. Quarrie KL, Hopkins WG. Tackle injuries in professional Rugby Union. *Am J Sports Med* 2008;36(9):1705-16. doi: 10.1177/0363546508316768 [published Online First: 2008/05/23]

2. Fuller CW, Molloy MG, Bagate C, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. *Br J Sports Med* 2007;41(5):328-31. doi: 10.1136/bjsm.2006.033282

3. Fuller CW, Brooks JH, Cancea RJ, et al. Contact events in rugby union and their propensity to cause injury. *Br J Sports Med* 2007;41:862-67.

Daily Medical Report on Injuries and Illnesses

Country: **Date of report:**

Form completed by: Name: Contact details:

Please report: **(1) All sport injuries and (2) all illnesses of your athletes newly incurred, recurrent or an exacerbation of an underlying stable injury/illness during the <name of the championship> regardless of the consequences with respect to absence from competition or training**. The information provided will be treated strictly confidential.

1. Injury – Example

Definitions and codes (see reverse)

age	gender	sport and event	date of injury	competition / training	code	onset code	new code
22	*~~male~~ / female*	*decathlon*	*21. July*	*sprint competition*	*2*	*1*	*~~1~~*
injury mechanism	code	injured body region	code	injury type	code	time-loss	duration
slipped and fell	*5*	*ankle*	*17*	*sprain*	*10*	*~~no~~ / yes*	*28 days*

age	gender	sport and event	date of injury	competition / training	code	onset code	new code
	male / female						
injury mechanism	code	injured body region	code	injury type	code	time-loss	duration
						no / yes	days

age	gender	sport and event	date of injury	competition / training	code	onset code	new code
	male / female						
injury mechanism	code	injured body region	code	injury type	code	time-loss	duration
						no / yes	days

age	gender	sport and event	date of injury	competition / training	code	onset code	new code
	male / female						
injury mechanism	code	injured body region	code	injury type	code	time-loss	duration
						no / yes	days

age	gender	sport and event	date of injury	competition / training	code	onset code	new code
	male / female						
injury mechanism	code	injured body region	code	injury type	code	time-loss	duration
						no / yes	days

2. Illness – Example

Definitions and codes (see reverse)

age	gender	sport and event	date of onset	organ system / region	code
27	*male / ~~female~~*	*athletics, pole vault*	*24th July*	*respiratory system*	*13*
aetiology	code	new, recurrent or exacerbation code	time-loss	duration	
Environmental - not exercise related	*3*	*1*	*~~no~~ / yes*	*2 days*	

age	gender	sport and event	date of onset	organ system / region	code
	male / female				
aetiology	code	new, recurrent or exacerbation code	time-loss	duration	
			no / yes	days	

age	gender	sport and event	date of onset	organ system / region	code
	male / female				
aetiology	code	new , recurrent or exacerbation code	time-loss	duration	
			no / yes	days	

age	gender	sport and event	date of onset	organ system / region	code
	male / female				
aetiology	code	new , recurrent or exacerbation code	time-loss	duration	
			no / yes	days	

age	gender	sport and event	date of onset	organ system / region	code
	male / female				
aetiology	code	new , recurrent or exacerbation code	time-loss	duration	
			no / yes	days	

If space is not sufficient to report all injuries or illnesses, please use additional forms.

❑ no new injury or illness in any athlete of our team today

Definitions and codes

For injuries (defined as tissue damage or other derangement of normal physical function due to participation in sports, resulting from rapid or repetitive transfer of kinetic energy)

Competition or training

1 competition, please specify event
2 training
3 peri-competition activities (e.g. warm-up, cool-down)

Mode of onset

1 sudden after acute trauma
2 sudden but no acute trauma
3 gradual
4 mixed

Injury mechanism

1 no identifiable single event (repetitive transfer of energy, overuse)
2 acute non-contact trauma
3 direct contact with another athlete
4 following contact with another athlete (e.g. fall after a push)
5 direct contact with an object (e.g. ball, wall, ground, i.e. slipped and fell)
6 following contact with an object

Injured body region

1 head / face
2 neck / cervical spine
3 chest (incl. chest organs)
4 thoracic spine / upper back
5 lumbar-sacral spine / buttock
6 abdomen (incl. abdominal organs)
7 shoulder
8 upper arm
9 elbow
10 forearm
11 wrist
12 hand
13 hip / groin
14 thigh
15 knee
16 lower leg / Achilles tendon
17 ankle
18 foot

Injury type

1 concussion / brain injury
2 spinal cord injury
3 peripheral nerve injury
4 bone fracture
5 bone stress injury
6 bone contusion
7 avascular necrosis
8 physis injury
9 cartilage injury
10 joint sprain / ligament tear
11 chronic instability
12 tendon rupture
13 tendinopathy
14 muscle strain / rupture / tear
15 muscle contusion
16 muscle compartment syndrome
17 laceration
18 abrasion
19 contusion / bruise (superficial)
20 arthritis
21 bursitis
22 synovitis
23 vascular damage
24 stump injury
25 internal organ trauma
26 unknown, or not specified

For illnesses (defined as a complaint or disorder not related to injury)

Organ system

1 cardiovascular
2 dermatological
3 dental
4 endocrinology
5 gastrointestinal
6 genitourinary
7 hematologic
8 musculoskeletal
9 neurological
10 ophthalmological
11 otological
12 psychiatric/psychological
13 respiratory system
14 thermoregulatory system
15 unknown, or not specified

Aetiology

1 allergic
2 environmental - exercise-related
3 environmental - non-exercise
4 immunological/inflammatory
5 infection
6 neoplasm
7 metabolic/nutritional
8 thrombotic/haemorrhagic
9 degenerative or chronic condition
10 developmental anomaly
11 drug-related/poisoning
12 unknown, or not specified

For injuries and illnesses

Sport and event

Please report the sport (e.g. athletics) *AND* specify the event (e.g. pole vault) if applicable.

New, recurrent or exacerbation

1 newly incurred during the championships
2 recurrent after full recovery and return-to-sport
3 exacerbation of a stable (not recovered) condition
4 unknown, or not specified

Time-loss in sport due to injury or illness

no athlete continues to train or compete, even if not at usual level (duration, intensity, performance)
yes athlete *did not finish* the training or competition when the injury occurred *OR* could not participate in sport later

Duration of impaired participation/ limited performance in sport due to injury or illness (in days)

Please provide an estimate of the number of days that the athlete will not be able to undertake his/her *normal training* or will not be able to *compete as usual*, counting the day ***after*** the onset of the injury/illness as day 1.

If an athlete is **not** expected to return to sport after the injury or illness, please state the reason: F=fatality, P=permanent disability, OR=reasons.

Medical Report of Injury or Illness

Date of report: _____

Team: _____ **Athlete identification:** _____ **Date of onset:** _____

For injury

Competition or training

☐ competition ☐ training ☐ peri-competition activities (e.g. warm-up, cool-down)

Mode of onset

☐ sudden after acute trauma ☐ sudden but no acute trauma ☐ gradual ☐ mixed

Injury mechanism (each category might have subcategories based on the purpose of the surveillance)

☐ no identifiable single event ☐ direct contact with another athlete ☐ direct contact with an object
☐ non-contact trauma ☐ following contact with another athlete ☐ following contact with an object

Injured body region (each category might have subcategories based on the purpose of the surveillance)

☐ head ☐ shoulder ☐ hip / groin
☐ neck / cervical spine ☐ upper arm ☐ thigh
☐ chest (incl. chest organs) ☐ elbow ☐ knee
☐ thoracic spine / upper back ☐ forearm ☐ lower leg / Achilles tendon
☐ lumbar-sacral spine / buttock ☐ wrist ☐ ankle
☐ abdomen (incl. abdominal organs) ☐ hand ☐ foot

Injury type

☐ concussion / brain injury ☐ joint sprain / ligament tear ☐ contusion / bruise (superficial)
☐ spinal cord injury ☐ chronic instability ☐ arthritis
☐ peripheral nerve injury ☐ tendon rupture ☐ bursitis
☐ bone fracture ☐ tendinopathy ☐ synovitis
☐ bone stress injury ☐ muscle strain / rupture / tear ☐ vascular damage
☐ bone contusion ☐ muscle contusion ☐ stump injury
☐ avascular necrosis ☐ muscle compartment syndrome ☐ internal organ trauma
☐ physis injury ☐ laceration ☐ unknown, or not specified
☐ cartilage injury ☐ abrasion

For illness

Organ system

☐ cardiovascular ☐ genitourinary ☐ otological
☐ dermatological ☐ hematologic ☐ psychiatric / psychological
☐ dental ☐ musculoskeletal ☐ respiratory system
☐ endocrinology ☐ neurological ☐ thermoregulatory system
☐ gastrointestinal ☐ ophthalmological ☐ unknown, or not specified

Aetiology

☐ allergic ☐ infectious disease ☐ degenerative or chronic condition
☐ environmental - exercise-related ☐ neoplasm ☐ developmental anomaly
☐ environmental - non-exercise ☐ metabolic / nutritional ☐ drug-related / poisoning
☐ immunological / inflammatory ☐ vascular ☐ unknown, or not specified

For injury and illness

New, recurrent or exacerbation

☐ new ☐ recurrent after full recovery and return-to-sport ☐ unknown, or not specified
☐ exacerbation of a stable (not recovered) condition

Time-loss in sport due to injury / illness

☐ no ☐ yes

Date of full return to normal training and competition _____ (dd/mm/yy)

No return to sport possible: ☐ fatality ☐ permanent disability ☐ other reasons _____

Appendix 3: STROBE-SIIS (Sports Injury and Illness Surveillance) Statement 1.0—Checklist of items for the reporting of observational studies on injury and illness in sports

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract		
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	SIIS-1.1. Include information on the sport, athlete population (sex, age, geographic region) and level of competition. SIIS-1.2. Include the duration of observation (e.g. one season, one year, multiple years).	SIIS-1.1. 'Study population characteristics' SIIS-1.2. 'Capturing and reporting athlete exposure'
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported		
Objectives	3	State specific objectives, including any pre-specified hypotheses	SIIS-3.1. State whether study was registered. Identify the registration number and database used. SIIS-3.2. State the specific purpose of your study (e.g. to describe the injury burden associated with Olympic level rowing)	SIIS-3.1. 'Reporting guidelines—STROBE Sports Injury and Illness Surveillance (STROBE-SIIS)' SIIS-3.2 Throughout consensus statement
Methods				
Study design	4	Present key elements of study design early in the paper	SIIS-4.1. Clearly specify which health problems are being observed.	SIIS-4.1. 'Defining and classifying health problems'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
			SIIS-4.2. State explicitly which approach was used to record the health problem data, including all outcome measures or tools SIIS-4.3. State explicitly which coding system was used to classify the health problems (e.g. OSIICS, SMDCS, ICD, etc.) SIIS-4.4. Where relevant, clearly describe how athletes were categorised. Variables to consider could include the type of athlete and/or sport, the environment in which the sport occurs (e.g. type of course or playing area), the typical duration of the sport, the degree of physical contact permitted in the sport, and the equipment permitted.	SIIS-4.2. 'Data collection methods' SIIS-4.3. 'Classifying sports injury and illness diagnoses' SIIS-4.4. 'Study population characteristics'
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	SIIS-5.1. Describe the location, level of play, dates of observation and data collection methods (i.e. who, what, where). SIIS-5.2. Specify the dates of the surveillance period and how the data were handled when the study covered more than one season/calendar year. SIIS-5.3. Define whether the health problem data were collected prospectively or retrospectively.	SIIS-5.1. 'Study population characteristics' SIIS-5.2. 'Capturing and reporting athlete exposure' SIIS-5.3. 'Capturing and reporting athlete exposure' and 'Data collection methods'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	SIIS-6.1. Define the population of athletes and how they were selected and recruited.	SIIS-6.1. 'Data collection methods' and 'Study population characteristics'
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case		
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	SIIS-7.1. Justify why you measured your primary and secondary outcomes of interest in the specific way chosen. SIIS-7.2. Describe the method for identifying your health problem outcome of interest.	SIIS-7.1. 'Defining and classifying health problems' SIIS-7.2. 'Defining and classifying health problems'
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe	SIIS-8.1. Specify who collected/reported the data for the	SIIS-8.1. 'Classifying sports injury and illness diagnoses' and 'Data collection methods'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
		comparability of assessment methods if there is more than one group	study and their qualifications (e.g. qualified doctor, data analyst, etc.). SIIS-8.2. Specify who coded the data for the study and their qualifications (e.g. qualified doctor, data analyst, etc.). In many instances, this will not be the same as SIIS-8.1. SIIS-8.3. Specify the direct methods used to collect the data, and the use of physical documents or an electronic tools. If extracting information from existing sources, specify the data source. SIIS-8.4. Specify the timing of and window for data collection (e.g. day health problem occurred or following day). Specify the frequency of data collection (e.g. daily, weekly, monthly). SIIS-8.5. Report the duration of surveillance (e.g. tournament, season, whole year, playing career).	SIIS-8.2. 'Classifying sports injury and illness diagnoses' SIIS-8.3. 'Data collection methods' SIIS-8.4. 'Relationship to sports activity' and 'Capturing and reporting athlete exposure' SIIS-8.5. 'Relationship to sports activity' and 'Capturing and reporting athlete exposure'
Bias	9	Describe any efforts to address potential sources of bias	SIIS-9.1. Clearly report any validation or reliability assessment of the data collection of tools. SIIS-9.2. Formally acknowledge any potential biases in associated with the data collection method (e.g. self-	SIIS-9.1. 'Data collection methods' SIIS-9.2. 'Data collection methods'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
			report, recall bias, reporting by non-medically trained staff, etc.)	
Study size	10	Explain how the study size was arrived at		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	SIIS-11.1 Explain in detail how multiple injuries/illness episodes are handled both in individual athletes and across athletes/surveillance periods. SIIS-11.2. Specify how injury severity was calculated.	SIIS-11.1. 'Multiple events and health problems' and 'Subsequent, recurrent and/or exacerbation of health problems' SIIS-11.2. 'Severity of health problems'
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	SIIS-12.1. Specify how exposure to risk has been adjusted for and specify the units (e.g. per participant, per athlete exposure, etc.). SIIS-12.2 Specify how relevant risk measures (incidence, prevalence, etc.) were calculated. SIIS-12.3. When relevant to the study aim, specify how injury burden was calculated and analysed.	SIIS-12.1. 'Capturing and reporting athlete exposure' SIIS-12.2 'Expressing risk' SIIS-12.3. 'Burden of health problems'
		(*b*) Describe any methods used to examine subgroups and interactions		
		(*c*) Explain how missing data were addressed	SIIS-12.4. For studies reporting multiple health problems, state clearly how these were handled (e.g. time to the first injury only, ignoring	SIIS-12.4. 'Multiple health problems' and 'Subsequent, recurrent and/or exacerbation of injury/illness' SIIS-12.5. 'Capturing and reporting athlete exposure'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
			subsequent return to play and re-injuries, or modelling of all injuries). SIIS-12.5. Explain how/if athletes not included at outset (e.g. those already injured) were handled in the analyses.	
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	SIIS-12.6. In longitudinal studies, it is particularly important to explain how athlete follow-up has been managed. For example, what happened if a player was transferred to another team or has been censored (for those no longer part of the study due to removal during the observation period). Censoring can occur when athletes are removed due to transfer out of the team/study, injury/illness or due to study design.	SIIS-12.6. 'Capturing and reporting athlete exposure'
		(*e*) Describe any sensitivity analyses		
Results				
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	SIIS-13.1. Clearly state the number of athletes followed-up, the number (and %) of those with the health problem and the number of problems reported among them (a median number of problems per affected athlete could be useful). SIIS-13.2. For studies over multiple seasons/years, report the total	SIIS-13.1. 'Multiple health problems' SIIS-13.2. 'Multiple health problems' and Expressing risk'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
			numbers of health problems for each year and numbers common to each period.	
		(b) Give reasons for non-participation at each stage	SIIS-13.3. Report how athletes removed (e.g. due to transfer of teams or time-out due to injury or illness) impact upon data at key data collection/reporting points, ideally with a flow diagram	SIIS-13.3. Throughout consensus statement
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	SIIS-14.1. Include detail on the level of competition being observed (e.g. by age levels, skill level, sex, etc.).	SIIS-14.1. 'Study population characteristics'
		(b) Indicate number of participants with missing data for each variable of interest		
		(c) *Cohort study*—Summarise follow-up time (e.g. average and total amount)		
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	SIIS-15.1. In many observational studies, individuals will sustain more than one health problem over the surveillance period. Take care to ensure descriptive data representing both the number of health problems and the number of athletes affected. It is important to represent effectively both the analysis and reporting of correct units for frequency data, i.e. the % of affected	SIIS-15.1. 'Multiple health problems' and 'Subsequent, recurrent and/or exacerbation of injury/illness'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
			athletes or the % of injuries, body regions, etc.	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure		
		Cross-sectional study—Report numbers of outcome events or summary measures		
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g. 95% confidence interval). Make clear which confounders were adjusted for and why they were included	SIIS-16.1. Report exposure-adjusted incidence or prevalence measures with appropriate confidence intervals when presenting risk measures. SIIS-16.2. Report details of interest, such as mode of onset	SIIS-16.1. 'Expressing risk' SIIS-16.2. 'Relationship to sports activity', 'Mode of onset—injury', Mode of onset—illness' and 'Classifying the mechanism of injury'
		(*b*) Report category boundaries when continuous variables were categorized		
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		
Other analyses	17	Report other analyses done—e.g. analyses of subgroups and interactions, and sensitivity analyses	SIIS-17.1 Report injury diagnosis information, including region and tissue type in tabular form.	SIIS-17.1. 'Defining and classifying health problems'
Discussion				
Key results	18	Summarise key results with reference to study objectives		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or	SIIS-19.1. Discuss limitations in the data collection and coding procedures adopted, including in	SIIS 19.1. 'Data collection methods' and 'Expressing risk'

Item	Item No	Recommendation from the STROBE Statement	STROBE-SIIS Extension [+]	Source of rationale for item from the consensus statement and where to find further details
		imprecision. Discuss both direction and magnitude of any potential bias	relation to any risk measures calculated.	
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence		
Generalisability	21	Discuss the generalisability (external validity) of the study results	SIIS-21.1. Discuss the generalizability of the athlete study population, and health problem sub-groups of interest, to broader athlete groups.	SIIS-21.2. 'Relationship to sports activity' and 'Study population characteristics'
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based		
Ethics	23		SIIS-23.1. Outline how individual athlete data privacy and confidentiality considerations were addressed, in line with the Declaration of Helsinki.	SIIS-23.1. 'Research ethics and data security'

Note: The STROBE-SIIS checklist with additional sports epidemiology annotations should be used in conjunction with the original STROBE guideline (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

[+]For brevity, the phrase health problem is used here to encompass both injury and illness.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

^^ Where there is a blank cell in this column, there are no specific additional reporting requirements for sports injury and illness surveillance over what is already covered in the original STROBE checklist.

Reference

1. Orchard O, Meeuwisse W, Derman W, et al. Refinement and presentation of the Calgary Sport Medicine Diagnostic Coding System (SMDSC) and the Orchard Sport Injury & Illness Classification System (OSIICS). *Br J Sports Med* In preparation