Global injury surveillance research in elite rugby union, 2022

WORLD RUGBY

Table of Contents

Background and Methodology

Background

Understanding the nature of injuries sustained in rugby union and how patterns of injury evolve are key priorities in continually identifying and managing the risks posed to players. For these reasons, injury surveillance research is fundamental to World Rugby's strategic aim of advancing player welfare standards across all ages and levels of the game.

Expanding the number of competitions globally that undertake injury surveillance studies remains a key priority for World Rugby, as demonstrated by the recent inclusion of injury surveillance research studies as a condition of accessing the Head Injury Assessment protocol under premium player welfare standards.

To assist injury surveillance studies with recording injuries and reporting findings in a consistent way, and thereby engendering the possibility of interstudy comparisons, World Rugby established a Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union in 2007[1].

The global injury surveillance update has been a feature of the Player Welfare and Laws symposium since 2019. In 2020, a change was made to present injury outcome measures as a weighted estimate across various elite domestic and international competitions, thereby providing a singular figure to reflect defined injury outcomes. In future, these weighted estimates will be used to longitudinally track injury incidence and severity across global elite rugby union.

Data retrieval

Organisers of elite men's and women's competitions were requested to supply the following information to World Rugby relating to their most-recently completed playing seasons:

- Volume of match exposure (expressed as player-match-hours)
- Number of match injuries that incurred subsequent time-loss of greater than 24 hours (hereafter referred to as '>24-hr T-L match injury')
- Total number of days lost to >24-hr T-L match injuries
- Standard error for mean >24-hr T-L match injury severity, reflected in number of days lost
- Number of match concussions
- Total number of days lost to match concussions
- Standard error for mean match concussion severity

[1] Fuller CW, Molloy MG, Bagate C, et al. Consensus statement on injury definitions and data collection procedures for studies of injuries in rugby union. British Journal of Sports Medicine 2007; 41:328-331.

For competitions that spanned two calendar years, requested data related to the 2020/21 playing season, while for single calendar year competitions, requested data related to the 2021 playing season.

Competitions were categorised into international and domestic playing levels. International competitions were characterised as those in which national teams participated, while domestic competitions featured club teams. The domestic playing level was further divided in to high performance and performance levels. High performance domestic competitions featured club teams from high performance tier Member Unions, while performance domestic competitions featured club teams from performance tier Member Unions.

Statistical Analyses

The statistical analyses conducted in this work were replicated from "A meta-analysis of injuries in Men's Professional Rugby Union" conducted by Williams et al. (2013)[2].

A series of mixed effect linear models were used to analyse four injury outcome measures: overall match >24-hour time-loss injury incidence, mean match >24-hour time-loss injury severity, match concussion incidence, and mean match concussion severity. For incidence-related outcomes (i.e., overall match injury incidence and match concussion incidence), a Poisson mixed-effects generalised linear model was used in which the number of match injuries, offset by the number of match exposure hours, were modelled. For severity-related outcomes (i.e., mean match injury severity and mean match concussion severity), a general linear mixed model was used in which mean number of days absent per injury was modelled. Furthermore, a weighting factor was applied whereby increasing weight in the overall estimate was given to competitions yielding larger datasets.

[2] Williams, S., Trewartha, G., Kemp, S. et al. A Meta-Analysis of Injuries in Senior Men's Professional Rugby Union. Sports Med 43, 1043–1055 (2013). https://doi.org/10.1007/s40279-013-0078-1

Results

Elite Rugby Competition Exposure and Injury Data

Table 1 outlines the exposure and injury data supplied by elite competitions for their most recently completed playing seasons.

Table 1. *Summary of match exposure and injury data supplied by competitions for most recent playing season*

	Domestic Men's Competitions	Domestic Women's Competitions	International Men's Competitions	International Women's Competitions
Number of Competitions	12	1	2	1
Match Exposure Hours	38 740	3 255	980	360
Match T-L* Injuries	2 033	155	91	33
Days lost to T-L* match injuries	33 614	8 823	2 686	1 186
Match Concussions	591	41	19	5
Days lost to match concussions	5 140	1 030	316	186

** T-L - Time-Loss. Only the number of injuries incurring subsequent time-loss of greater than 24 hours following onset were supplied*

Elite Men's Rugby

Match Injury Incidence

Figure 1 illustrates individual competition match injury incidence rates, subset match injury incidence rates for international and domestic competitions, and the overall weighted estimate for match injury incidence. A total of 2 124 time-loss match injuries were accrued from 39 720 player-match-hours of exposure across elite men's competitions during the 2020/2021 playing season.

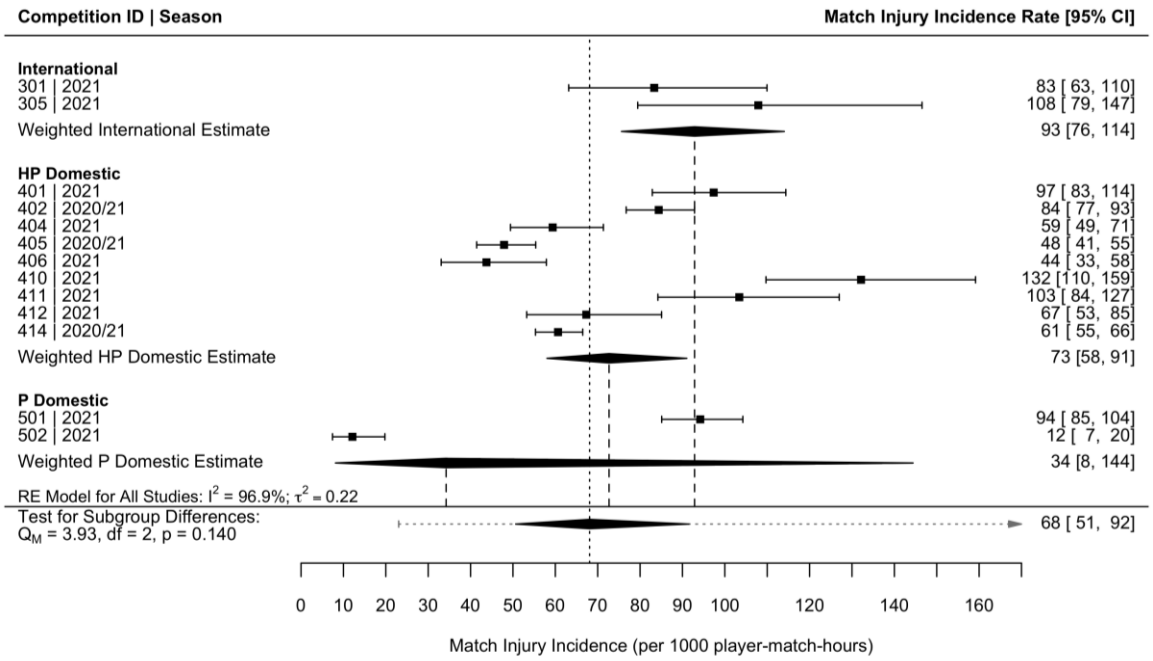

Figure 1. *Forest Plot illustrating match injury incidence rates by individual competitions, with weighted overall and subset estimates for international and domestic playing levels of elite men's rugby. The centre of each diamond represents the estimated incidence rate, with the widths reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP- High Performance; P- Performance.*

The overall weighted estimate of 68 injuries/1000 player-match-hours (95% confidence interval [95% CI] 51 to 92), translates to an average of 2.7 time-loss injuries occurring per match. For international competitions, the estimated match injury incidence of 93 injuries/1000 player-match-hours (95% CI 76 to 114) indicates an average of 3.7 injuries sustained per match. For high performance tier domestic competitions, match injury incidence was estimated to be 73 injuries/1000 player-match-hours (95% CI 58 to 91), or approximately 2.9 time-loss injuries sustained per match on average. Estimated match injury incidence in performance tier domestic competitions was 34 injuries/1000 player-match-hours (95% CI 8 to 144), or approximately 1.4 injuries suffered per match, on average. Playing level was not found to exert a significant effect on match injury incidence (*P*= 0.14).

Match Injury Severity

Figure 2 illustrates the mean number of days absent per injury for individual competitions, subset estimates of mean match injury severity for international and domestic competitions, and the overall weighted estimate for mean match injury severity. Match injury severity data were unavailable for several competitions, with a total of 36 300 days lost to match injuries (n= 1 181) across elite men's competitions used in analyses.

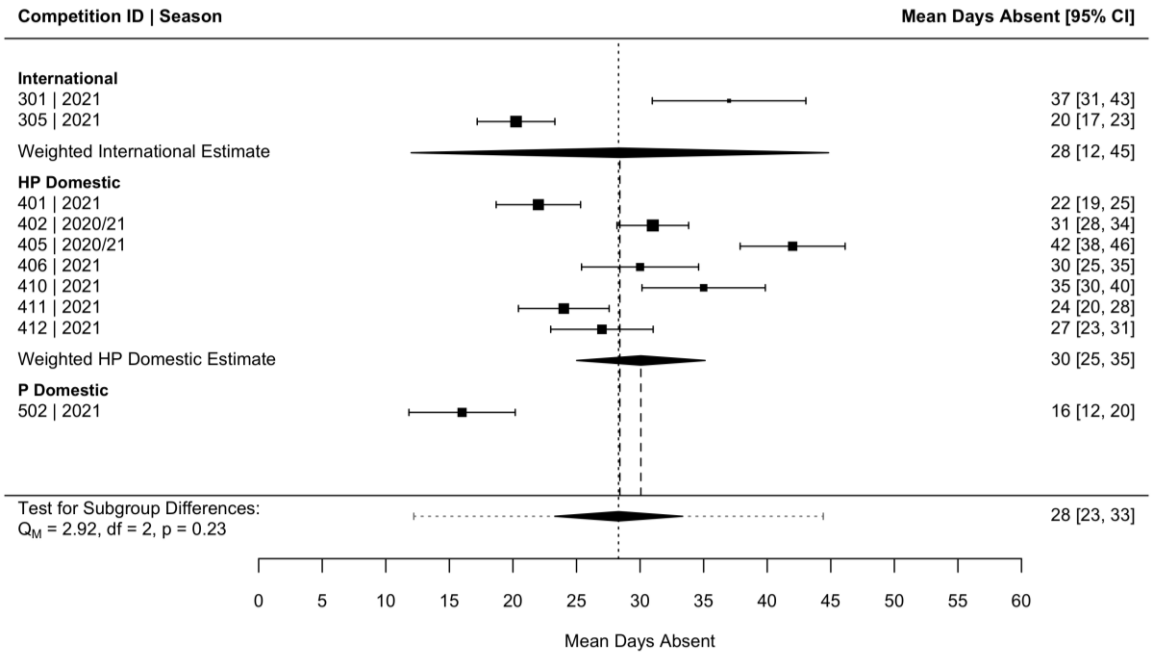

Figure 2. *Forest Plot illustrating match injury severity by individual competitions, with weighted overall and subset estimates for international and domestic playing levels of elite men's rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance; P - Performance*

The overall weighted estimate of mean match injury severity for all elite competitions in 2020/2021 was 28 days lost per injury (95% CI 23 to 33), or 1 927 days lost/1000 player-match hours when expressed as injury burden (product of incidence and mean severity). Playing level was not found to exert a significant influence on match injury severity (*P*=0.23). Mean injury severity in international competitions was estimated to be 28 days lost per injury (95% CI 12 to 45) or 2 638 days lost/1000 player-match-hours, while an average of 30 days lost per injury (95% CI 25 to 35) or 2 185 days lost/1000 player-match-hours was estimated for high performance tier domestic competitions.

Match Concussion Incidence

Figure 3 illustrates individual competition match concussion incidence rates, subset match concussion incidence rates for international and domestic competitions, and the overall weighted estimate for match concussion incidence. A total of 610 match concussions were accrued from 39 720 player-match-hours of exposure across elite men's competitions during the 2020/2021 playing season.

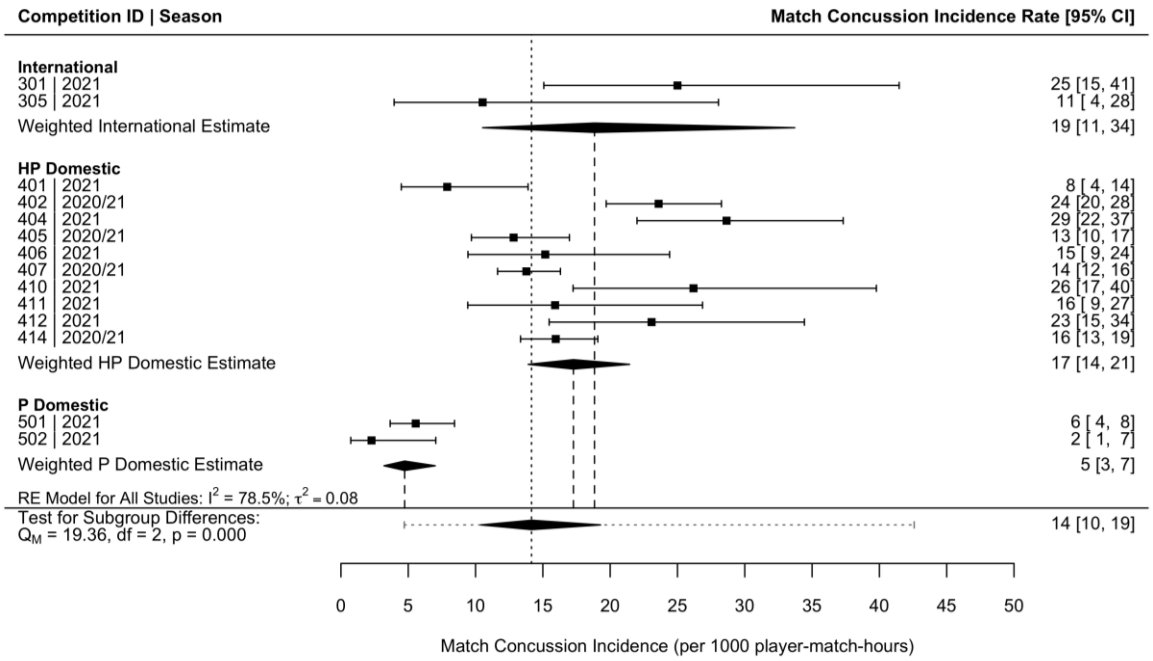

Figure 3. *Forest Plot illustrating match concussion incidence rates by individual competitions, with weighted overall and subset estimates for international and domestic playing levels of elite men's rugby. The centre of each diamond represents the estimated incidence rate, with the widths reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance; P - Performance*

The overall weighted estimate of 14 concussions/1000 player-match-hours (95% CI 10 to 19) translates to one concussion occurring every 1.8 matches in elite men's rugby, on average. For international competitions, the estimated match concussion incidence of 19 concussions/1000 player-match-hours (95% CI 11 to 34) equates to one concussion occurring every 1.3 matches, on average. Across high performance tier domestic competitions, the estimated match concussion incidence of 17/1000 player-match-hours (95% CI 14 to 21) equates to one concussion occurring every 1.4 matches, on average. The estimated incidence of match concussions in performance tier domestic competitions was 5/1000 player-match-hours (95% CI 3 to 7), or one concussion occurring every 5.3 matches on average. Playing level was found to exert a significant effect on match concussion incidence ($P<0.001$).

Match Concussion Severity

Figure 4 illustrates mean number of days absent per injury for individual competitions, subset estimates of mean match injury severity for international and domestic competitions, and the overall weighted estimate for mean match injury severity. Concussion severity data were unavailable for several competitions, with a total of 5 456 days lost to match concussions (n= 333) across elite men's competitions in 2020/2021 playing seasons.

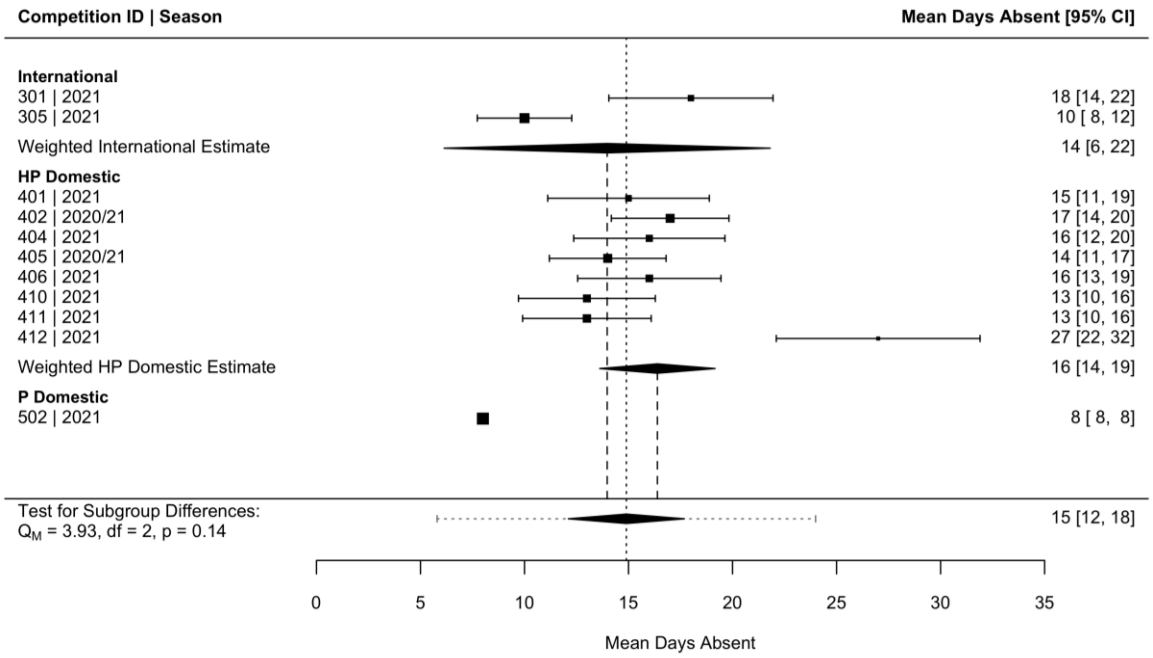

Figure 4. *Forest Plot illustrating match concussion severity by individual competitions, with weighted overall and subset estimates for international and domestic playing levels of elite men's rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases.*

The overall weighted estimate of mean match concussion severity for elite men's competitions in 2020/2021 was 15 days lost per concussion (95% CI 12 to 18) or 211 days lost/1000 player-match-hours. Match concussion severity in international competitions was estimated to be 14 days lost per concussion (95% CI 6 to 22) or 263 days lost/1000 player-match-hours. For high performance tier domestic competitions, estimated match concussion severity was 16 days lost per concussion (95% CI 19 to 19) or 283 days lost/1000 player-match-hours. Playing level was not found to exert a significant influence on match concussion severity(*P*=0.14).

Elite Women's Rugby

Because data were available for only two competitions (one international, one domestic), it was not possible to provide weighted subset estimates for domestic and international competitions across any outcome measures. Only overall weighted estimates for elite women's rugby will be considered in this report.

Match Injury Incidence

Figure 5 illustrates individual competition match injury incidence rates, and the overall weighted estimate for match injury incidence. A total of 188 time-loss match injuries were accrued from 3 615 player-match-hours of exposure across elite women's competitions during the 2020/21 season.

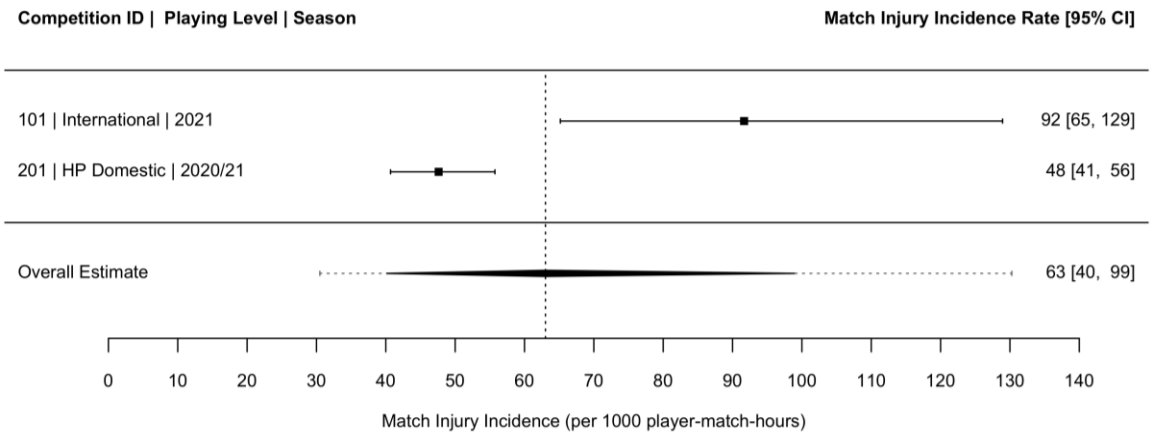

Figure 5. *Forest Plot illustrating match injury incidence rates by individual competitions, with weighted overall estimate for elite women's rugby. The centre of the diamond represents the estimated incidence rate, with the width reflecting the precision of the estimate. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance*

The overall weighted estimate of 63 injuries/1000 player-match-hours (95% CI 40 to 99) translates to 2.5 injuries suffered per match in elite women's rugby.

Match Injury Severity

Figure 6 illustrates mean number of days absent per injury for individual competitions and the overall weighted estimate for mean match injury severity. A total of 10 009 days were lost to match injuries across elite women's competitions in the 2020/2021 playing season.

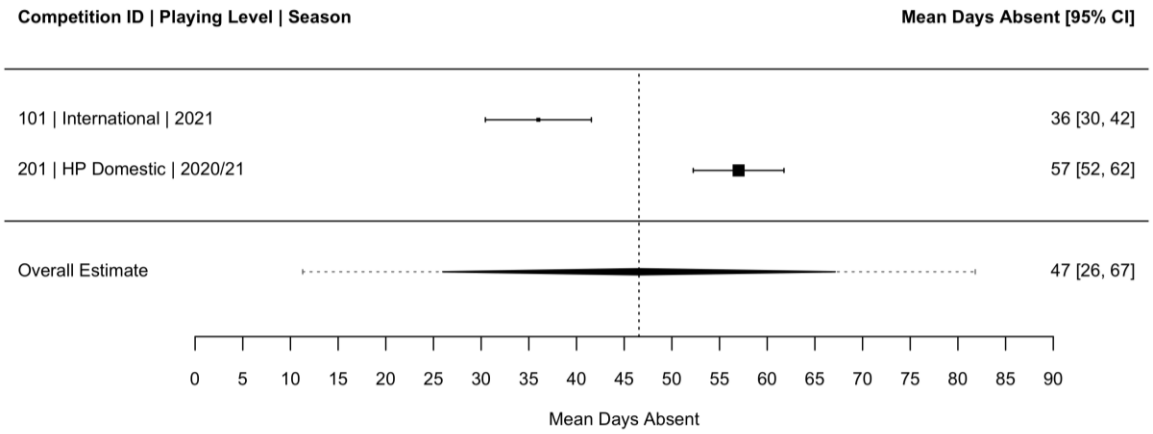

Figure 6. *Forest Plot illustrating match injury severity by individual competitions, with weighted overall estimate for elite women's rugby. The centre of the diamond represents the estimated mean days absent, with the width reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance*

The overall weighted estimate of mean match injury severity for all elite competitions in 2020/2021 was 47 days lost per injury (95% CI 26 to 67) or 2 934 days lost/1000 player-match-hours.

Match Concussion Incidence

Figure 7 illustrates individual competition match concussion incidence rates and the overall weighted estimate for match concussion incidence. A total of 46 match concussions were reported from 3 615 player-match-hours of exposure across elite women's competitions during the 2020/2021 playing season.

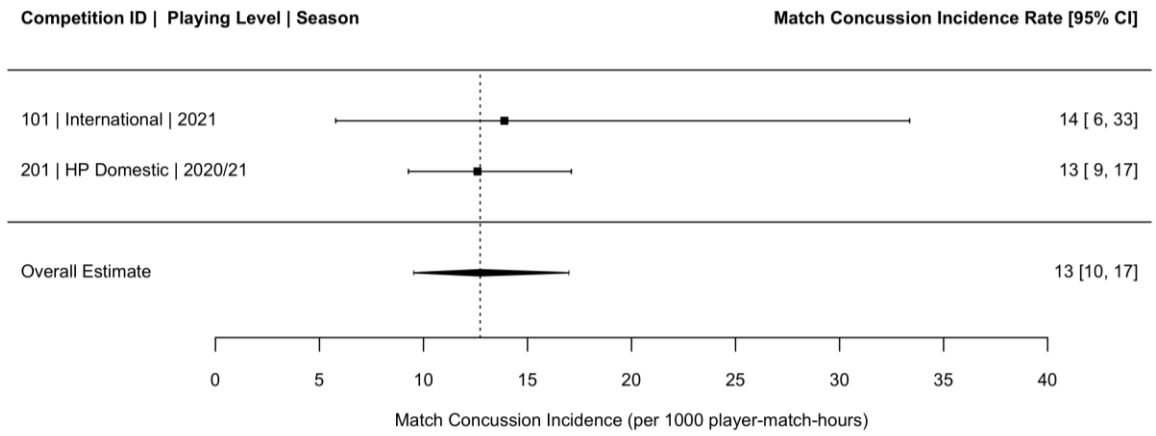

Figure 7. *Forest Plot illustrating match concussion incidence rates by individual competitions, with weighted overall estimate for elite women's rugby. The centre of the diamond represents the estimated incidence rate, with the width reflecting the precision of the estimate. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance*

The overall weighted estimate of 13 concussions/1000 player-match-hours (95% CI 10 to 17) translates to one concussion occurring every 2 matches in elite women's rugby, on average.

Match Concussion Severity

Figure 8 illustrates mean number of days absent per concussion for individual competitions and the overall weighted estimate for mean match concussion severity. A total of 1 216 days were lost to match concussions across elite women's competitions in 2020/2021 playing seasons.

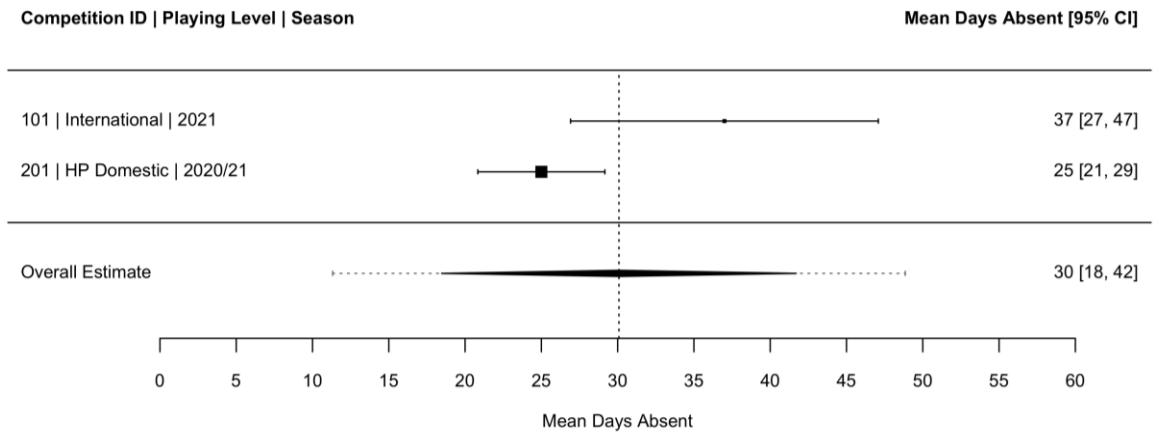

Figure 8. *Forest Plot illustrating match concussion severity by individual competitions, with weighted overall estimate for elite women's rugby. The centre of the diamond represents the estimated mean days absent, with the width reflecting the precision of the estimates. The dashed line depicts the 95% prediction interval for the estimate, which shows the range of estimates in which a future observation will fall in 95% of cases. HP – High Performance.*

Mean match concussion severity for elite women's competitions in 2020/2021 was 30 days lost per concussion (95% CI 18 to 42) or 383 days lost/1000 player-match-hours.

Change in injury outcomes from previous playing seasons

Figures 9-11 illustrate the changes since the 2018/19 playing season in weighted overall estimates of match injury incidence, concussion incidence, match injury severity, and concussion severity.

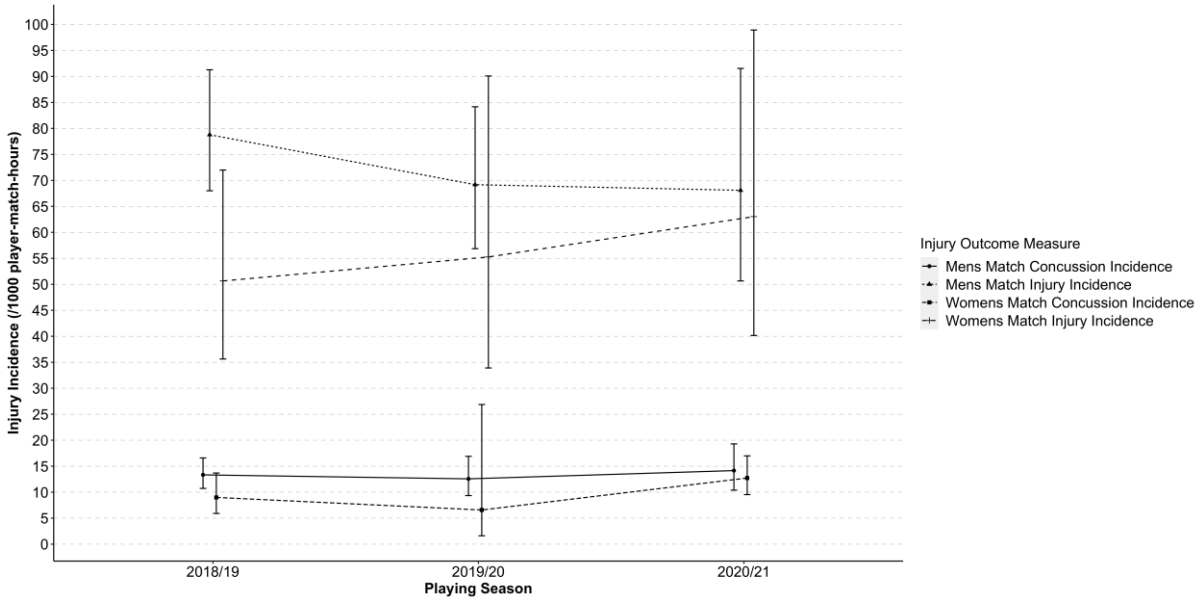

Figure 9. *Line graph illustrating changes in injury incidence since the 2018/19 playing season for elite men's and women's rugby. Error bars reflect 95% CI.*

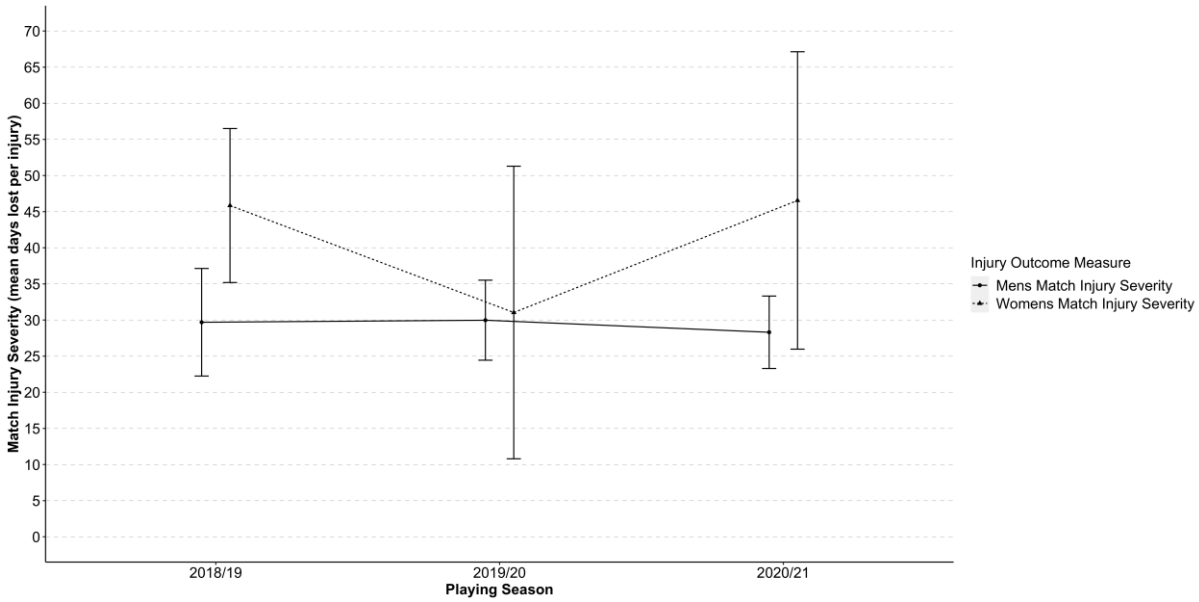

Figure 10. *Line graph illustrating changes in match injury severity since the 2018/19 playing season for elite men's and women's rugby. Error bars reflect 95% CI.*

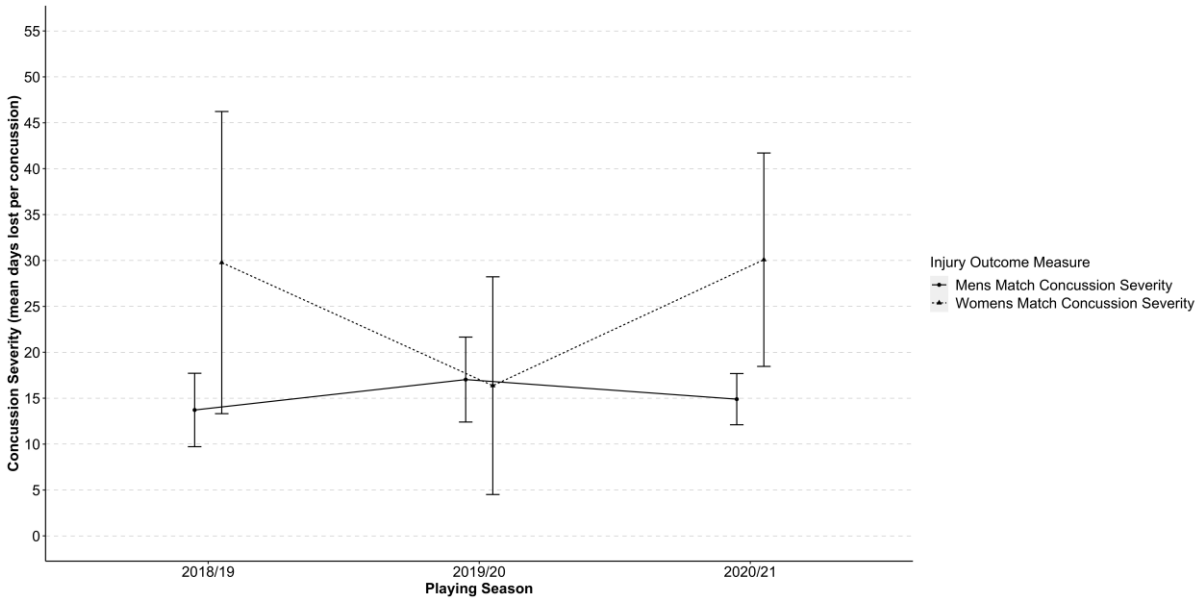

Figure 11*. Line graph illustrating changes in match concussion severity since the 2018/19 playing season for elite men's and women's rugby. Error bars reflect 95% CI.*

Acknowledgements

World Rugby would like to thank all competition organisers and affiliated research teams for kindly sharing data for this report.