A review of injury surveillance research in community rugby union, 2015-2022

WORLD RUGBY

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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 and variety of settings in which injury surveillance studies are undertaken remains a key priority for World Rugby. 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]. This guidance was recently adapted to more closely reflect the different circumstances that community and recreational rugby can present for conducting injury surveillance research[2].

The global injury surveillance update has been a feature of the Player Welfare and Laws symposium since 2019. Since 2021, injury outcome measures have been presented as weighted estimates across various settings in community rugby, thereby providing a singular figure to reflect these injury outcomes across numerous playing demographics.

Data retrieval

Known injury surveillance programmes for community rugby that collected data in accordance with the Consensus Statement for studies of injuries in rugby union were requested to supply the following information:

- Volume of match exposure, expressed as player-match-hours and calculated as number of matches * number of on-field players per team * match duration/60
- Number of match injuries that incurred subsequent time-loss of greater than 7 days (hereafter referred to as '>7d T-L match injury')
- Total number of days lost to >7d T-L match injuries
- Standard error for mean >7d 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.
[2] Brown JC, Cross M, England M, et al. Guidelines for community-based injury surveillance in rugby union. Journal of Science and Medicine in Sport 2019;22:1314-1318.

To increase the volume of available data while providing contemporary estimates of injury outcomes in community rugby settings, data going back over the previous five playing seasons were included in analyses where available.

All individual studies were issued an ID number which is displayed in figures in this report. A table containing competition categories with corresponding ID number range is provided below.

Competition category	ID numbers
Male under-13	101-199
Male under-15 and under-16	201-299
Female under-16	301-399
Male under-18	401-499
Female under-18	501-599
Female adult	601-699
Male adult	701-799

Statistical Analyses

The statistical analyses conducted in this work were replicated from a meta-analysis of injuries in Mens Professional Rugby Union conducted by Williams et al. (2013)[3].

A series of mixed effect linear models were used to analyse four injury outcome measures: overall match >7-day time-loss injury incidence, mean match >7-day time-loss injury severity, match concussion incidence, and mean match concussion severity. For 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 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. A weighting factor was applied whereby increasing weight in the overall estimate was given to competitions yielding larger datasets. A random effect was included in all models to account for potential clustering arising from multiple entries of the same studies in the dataset.

[3] 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

Exposure and Injury Data

Table 1 outlines the exposure and injury data supplied for community rugby injury surveillance programmes since the 2015/16 playing season.

Table 1. *Summary of match exposure and injury data supplied by community injury surveillance studies for analyses*

	Under-13 Male	Under-15/ Under-16 Male	Under-16 Female	Under-18 Male	Under-18 Female	Senior Female	Senior Male
Number of studies	3	3	1	5	1	1	2
Study-Seasons Observed	9	9	2	15	2	3	8
Match Exposure Hours	6 207.5	9 471.5	1 440	25 690.5	1 680	4 880	147 540
Match T-L* Injuries	62	115	25	548	24	129	3 738
Days Lost to T-L* Match Injuries	1 248†	2613†	†	15 818†	†	7 618	176 163
Match Concussions	24	44	14	147	14	27	561
Days Lost to Match Concussions	426†	868†	†	3 623†	†	903	17 486

** T-L - Time-Loss. Only the number of injuries incurring subsequent time-loss of greater than 7 days following onset were included in analysis. †* time-loss severity data not available for some programmes

Match Injury Incidence

Figures 1a to 1c illustrate individual study match injury incidence rates and estimated subset >7-day T-L match injury incidence rates for junior male players (under-13, under 15/16, and under-18 age groups), junior female players (under-16 and under-18 age groups), senior female players and senior male players in community rugby settings. A total of 4 641 >7-day T-L match injuries were reported from 196 909.5 player-match-hours of exposure across the included studies between the 2015/16 and 2019/20 playing seasons.

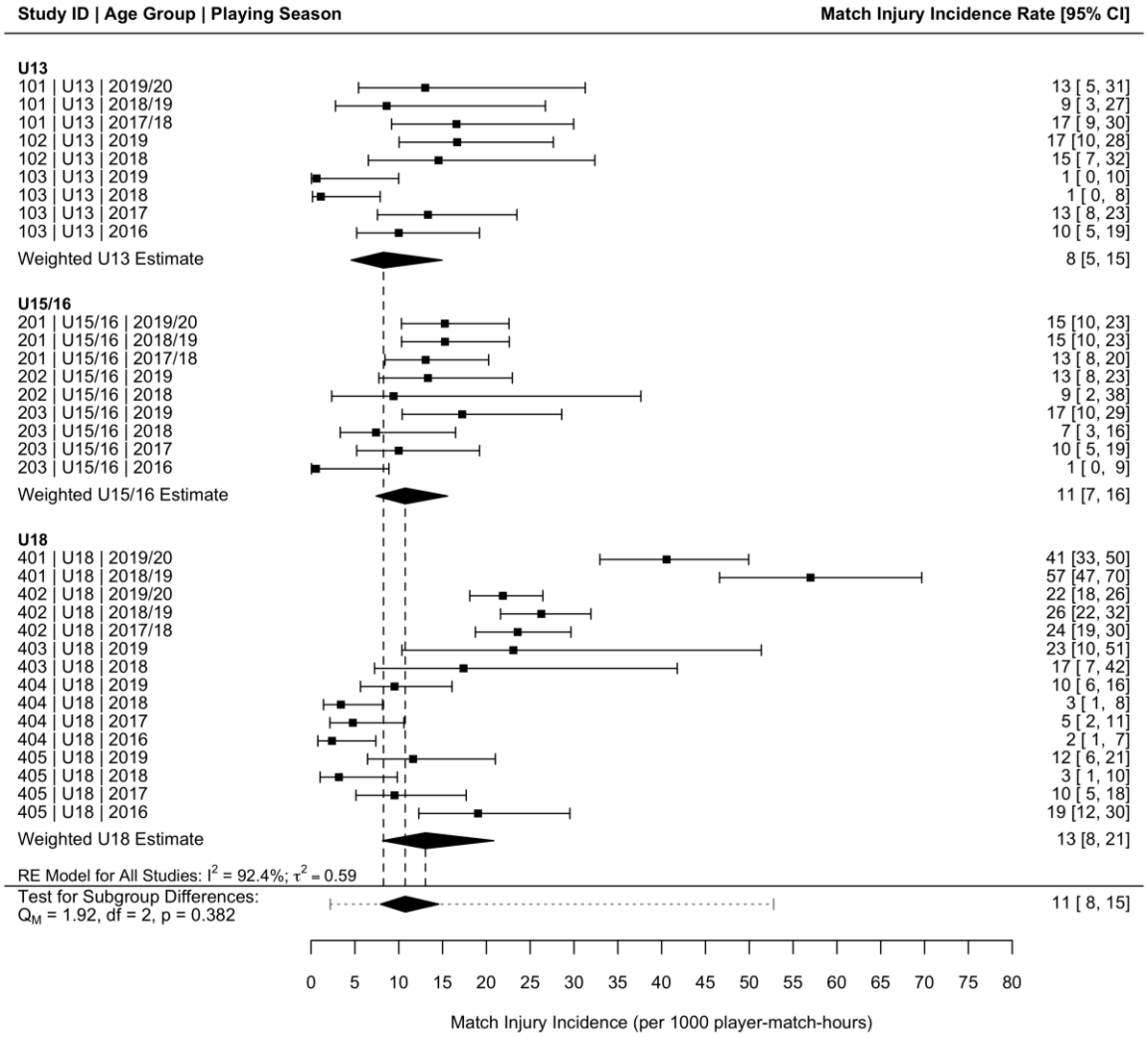

Figure 1a. *Forest Plot illustrating match injury incidence rates by individual studies, with weighted subset estimates for age groups in community junior male rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision of the estimates. The dashed 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.*

In U13 male rugby, the weighted estimate of 8 injuries/1000 player-match-hours (95% CI 5 to 15) translates to approximately one injury reported every 4.8 matches. For U15/16 male rugby, weighted match injury incidence was estimated as 11/1000 player-match-hours (95% CI 7 to 16), translating to one injury sustained every 3.1 matches on average. Weighted match injury incidence in U18 male rugby was estimated to be 13/1000 player-match-hours (95% CI 8 to 21), which equates to one injury occurring every 2.2 matches, on average. Age group was not shown to significantly affect injury incidence (*P*=0.382).

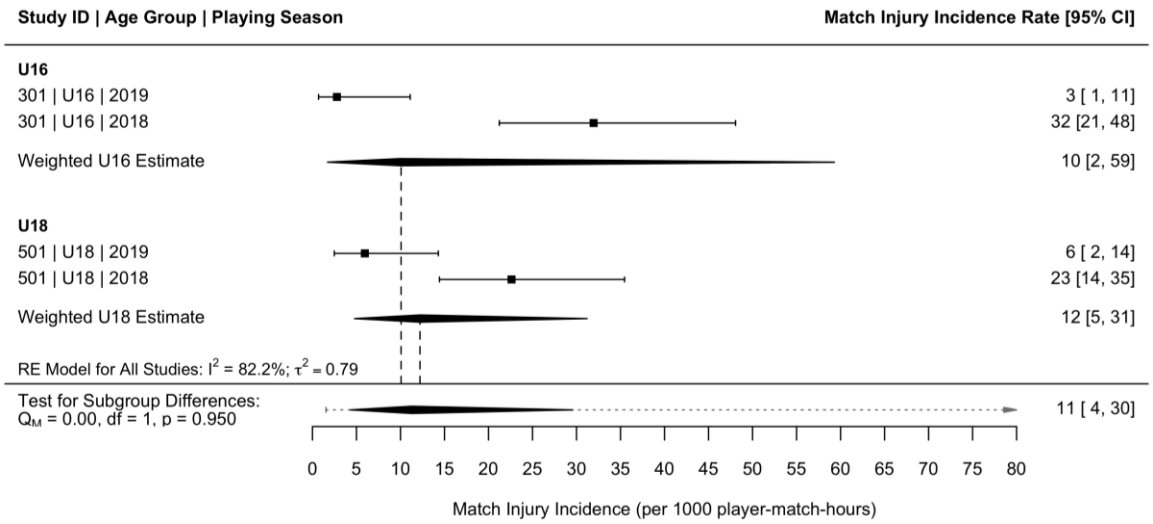

Figure 1b. *Forest Plot illustrating match injury incidence rates by individual studies, with weighted subset estimates for age groups in community junior female rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision of the estimates. The 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.*

In U16 female rugby, the weighted estimate of 10 injuries/1000 player-match-hours (95% CI 2 to 59) translates to one injury sustained per 3.3 matches. The weighted match injury incidence in U18 female rugby was estimated to be 12/1000 player-match-hours (95% CI 5 to 31), which equates to one injury occurring every 2.3 matches, on average. Age group was not found to significantly affect injury incidence (*P*=0.95).

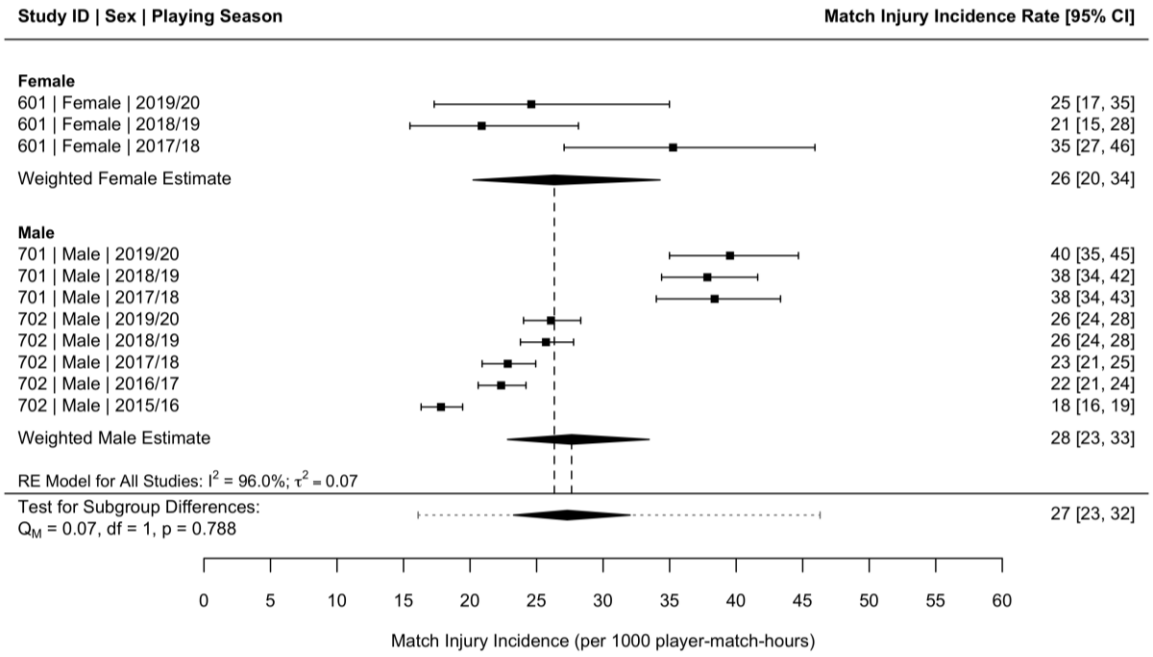

Figure 1c. *Forest Plot illustrating match injury incidence rates by individual studies, with weighted subset estimates for community senior female and male rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision*

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.

In senior rugby, the weighted match injury incidence estimates for female (26/1000 player-match-hours, 95% CI 20 to 34) and male players (28/1000 player-match-hours, 95% CI 23 to 33) both approximated one injury occurring every match, on average. Biological sex did not significantly influence injury incidence (*P*=0.788).

Match Injury Severity

Figures 2a and 2b illustrate the mean number of days absent per injury for each study and estimated subset match injury incidence rates for junior male players, senior female players, and senior male players in community rugby settings. A total of 203 460 days were lost to match injuries across the included studies.

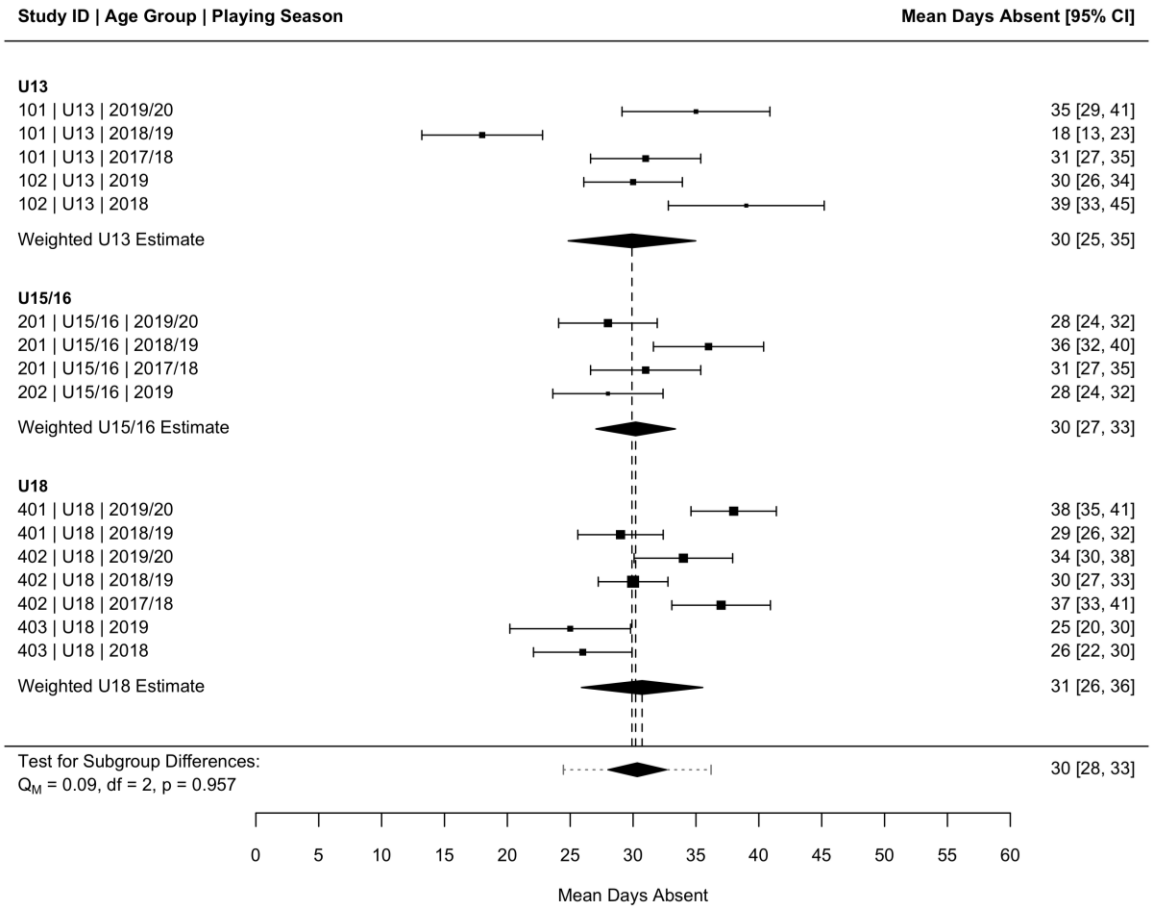

Figure 2a. *Forest Plot illustrating match injury severity by individual studies, with weighted subset estimates for age groups in community junior male rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The dashed line 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.*

In U13 male rugby, weighted mean injury severity was estimated to be 30 days (95% CI 25 to 35) with an estimated burden (product of incidence and mean severity) of 247 days lost/1000 player-match-hours. In U15/16 male rugby, weighted mean injury severity was estimated to be 30 days (95% CI 27 to 33) with an estimated burden of 324 days lost/1000

player-match-hours. Estimated mean injury severity was 31 days (95% CI 26 to 36) in U18 male rugby, with an estimated burden of 401 days lost/1000 player-match-hours. Age group did not significantly influence injury severity (*P*=0.957).

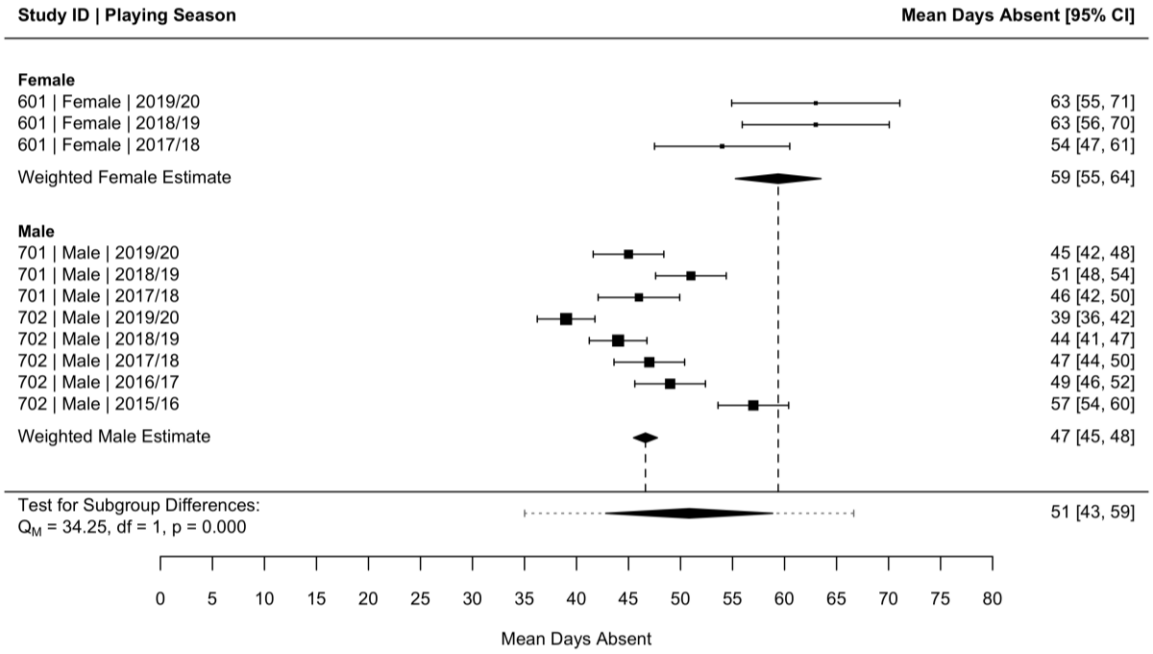

Figure 2b. *Forest Plot illustrating match injury severity by individual studies, with weighted subset estimates for community senior female and male rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The dashed line 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.*

In senior rugby, the weighted match injury severity estimate for female players (59 days, 95% CI 55 to 64), when combined with match injury incidence, equates to a burden of 1 564 days lost/1000 player-match-hours. In senior male rugby, weighted match injury severity was estimated to be 47 days (95% CI 45 to 48), with a burden of 1 288 days lost/1000 player-match-hours. Biological sex significantly influenced injury severity (*P*<0.001).

Match Concussion Incidence

Figures 3a to 3c illustrate individual study match concussion incidence rates and estimated subset >7-day T-L match concussion incidence rates for junior male players, junior female players, senior female players, and senior male players in community rugby settings. A total of 831 >7-day T-L match concussions were accrued from 196 909.5 player-match-hours of exposure across the included studies between the 2015/16 and 2019/20 playing seasons.

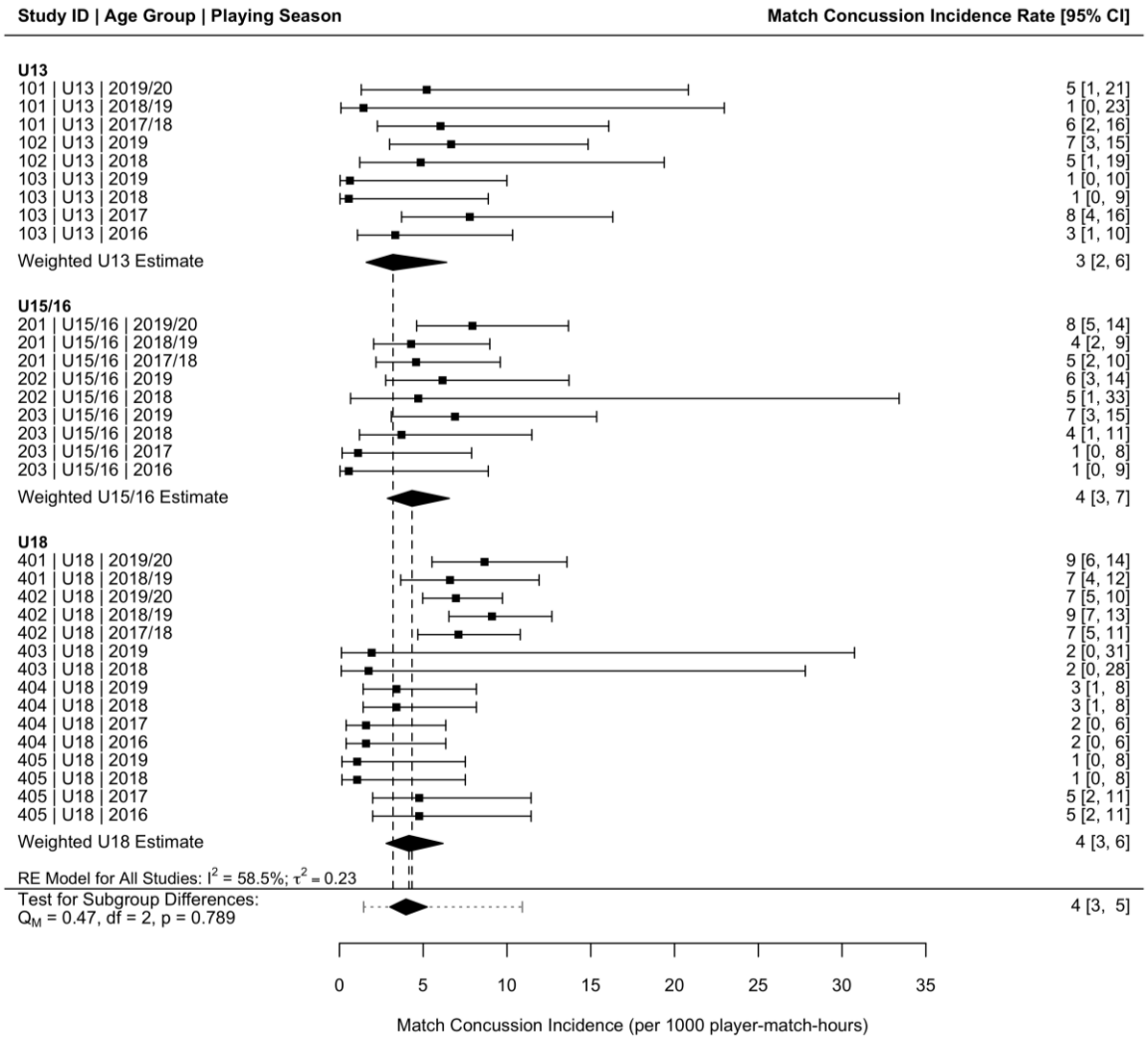

Figure 3a. *Forest Plot illustrating match concussion incidence rates by individual studies, with weighted subset estimates for age groups in community junior male rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision of the estimates. The 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.*

In U13 male rugby, the weighted estimate of 3 concussions/1000 player-match-hours (95% CI 2 to 6) equates to approximately one concussion sustained per 12.5 matches. In U15/16 male rugby, the weighted match concussion incidence estimate of 4/1000 player-match-hours (95% CI 3 to 7) translates to one concussion sustained every 7.7 matches on average. The weighted match injury incidence estimate in U18 male rugby of 4/1000 player-match-hours (95% CI 3 to 6), approximates one concussion occurring every 6.9 matches, on average. Age group did not significantly affect concussion incidence (*P*=0.789).

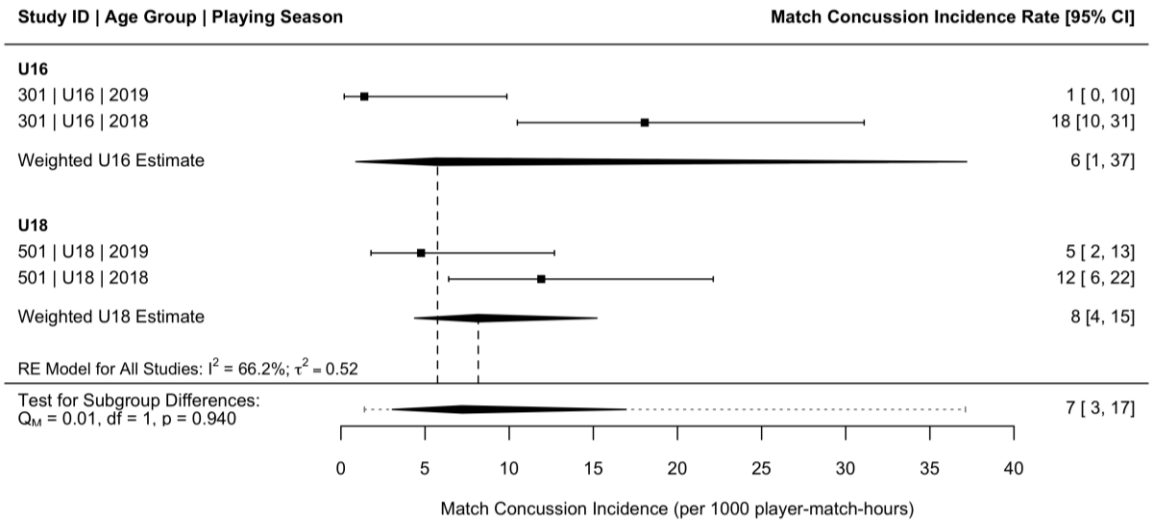

Figure 3b. *Forest Plot illustrating match concussion incidence rates by individual studies, with weighted subset estimates for age groups in community junior female rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision of the estimates. 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.*

In U16 female rugby, the weighted estimate of 6 concussions/1000 player-match-hours (95% CI 1 to 37) equates to approximately one concussion sustained per 5.8 matches. The weighted match injury incidence in U18 female rugby was estimated to be 8/1000 player-match-hours (95% CI 4 to 15), which equates to one concussion occurring every 3.5 matches, on average. Age group did not significantly affect concussion incidence (P=0.94).

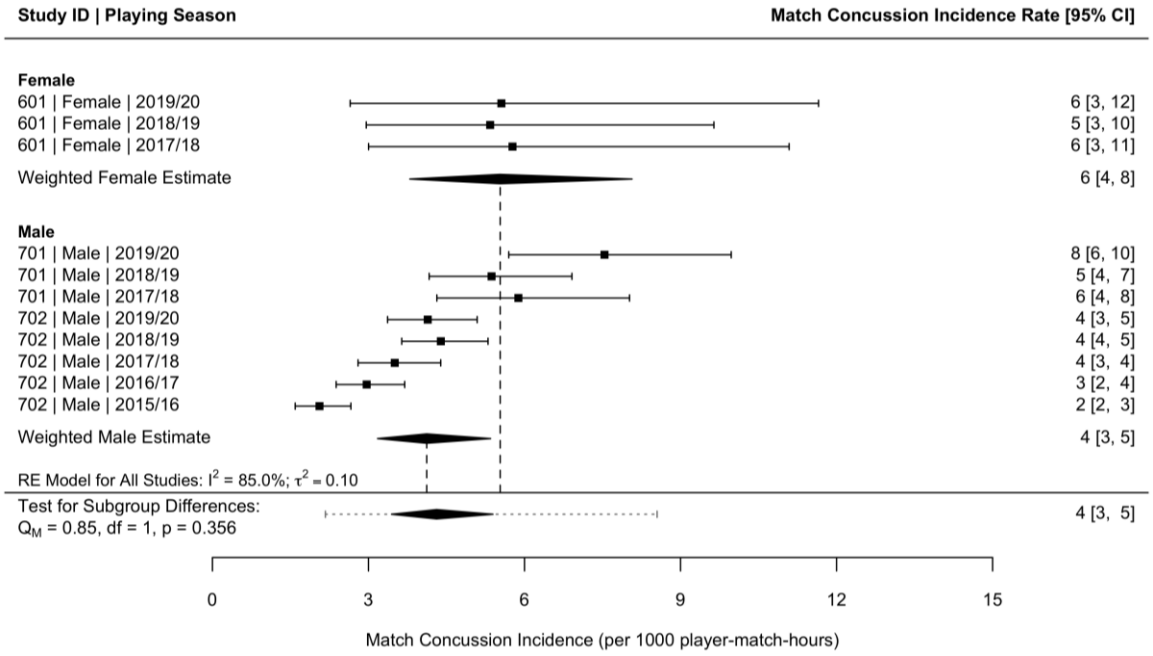

Figure 3c. *Forest Plot illustrating concussion incidence rates by individual studies, with weighted subset estimates for community senior female and male rugby. The centre of each diamond represents the estimated incidence rates, with the widths reflecting the precision*

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.

In senior female rugby, the weighted match concussion incidence estimate (6/1000 player-match-hours, 95% CI 4 to 8) equates to one concussion occurring every 4.5 matches on average. In senior male rugby, weighted match concussion incidence estimate of 4/1000 player-match-hours (95% CI 3 to 5), translates to one concussion being sustained in every 6.1 matches on average. Biological sex did not significantly influence concussion incidence (*P*=0.356).

Match Concussion Severity

Figures 4a and 4b illustrate the mean number of days absent per concussion for each study and estimated subset match injury incidence rates for junior male players, senior female players, and senior male players in community rugby settings. A total of 23 306 days were lost to match concussions across included studies (severity data were attached to 757 reported concussions in the dataset).

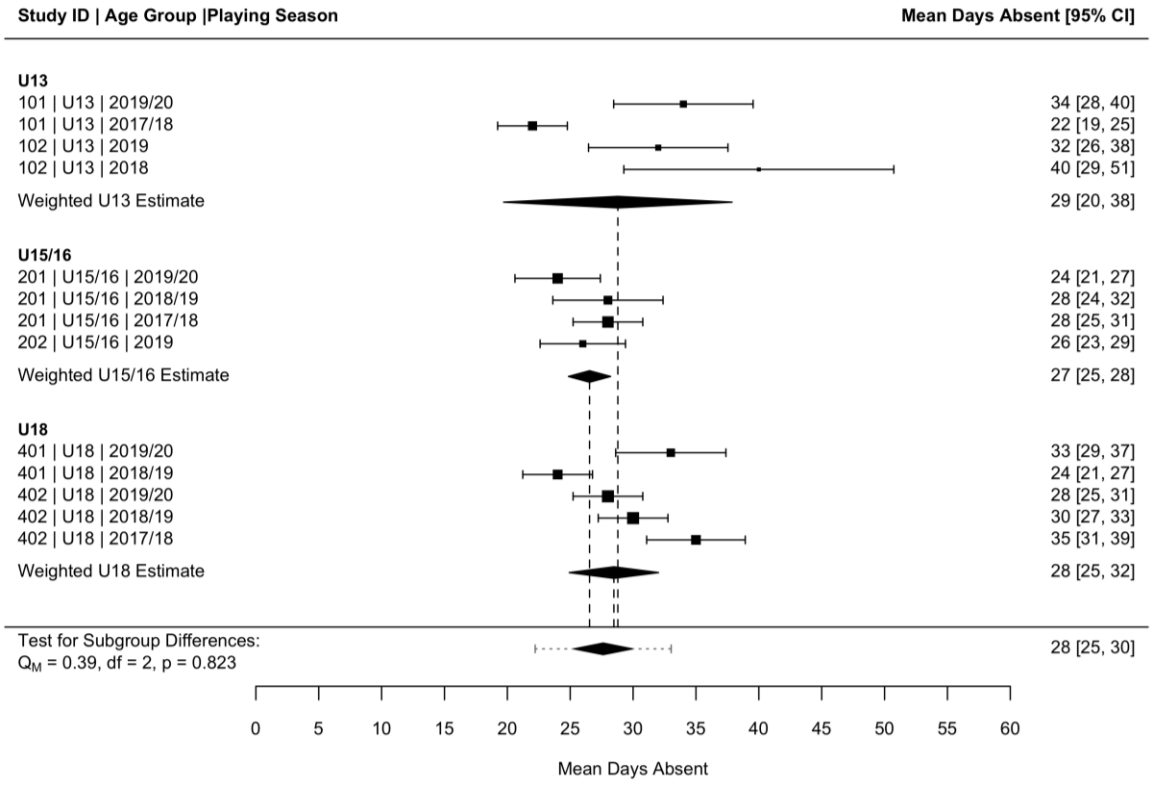

***Figure* 4a**. *Forest Plot illustrating match concussion severity by individual studies, with weighted subset estimates for age groups in community junior male rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The 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.*

In U13 male rugby, weighted mean concussion severity was estimated to be 29 days (95% CI 20 to 38) with an estimated burden of 92 days lost/1000 player-match-hours. For U15/16 male rugby, weighted mean concussion severity was estimated to be 27 days (95% CI 25 to

28) with an estimated burden of 115 days lost/1000 player-match-hours. Estimated mean concussion severity was 28 days (95% CI 25 to 32) in U18 male rugby, with an estimated burden of 118 days lost/1000 player-match-hours. Age group did not significantly affect concussion severity (*P*=0.823).

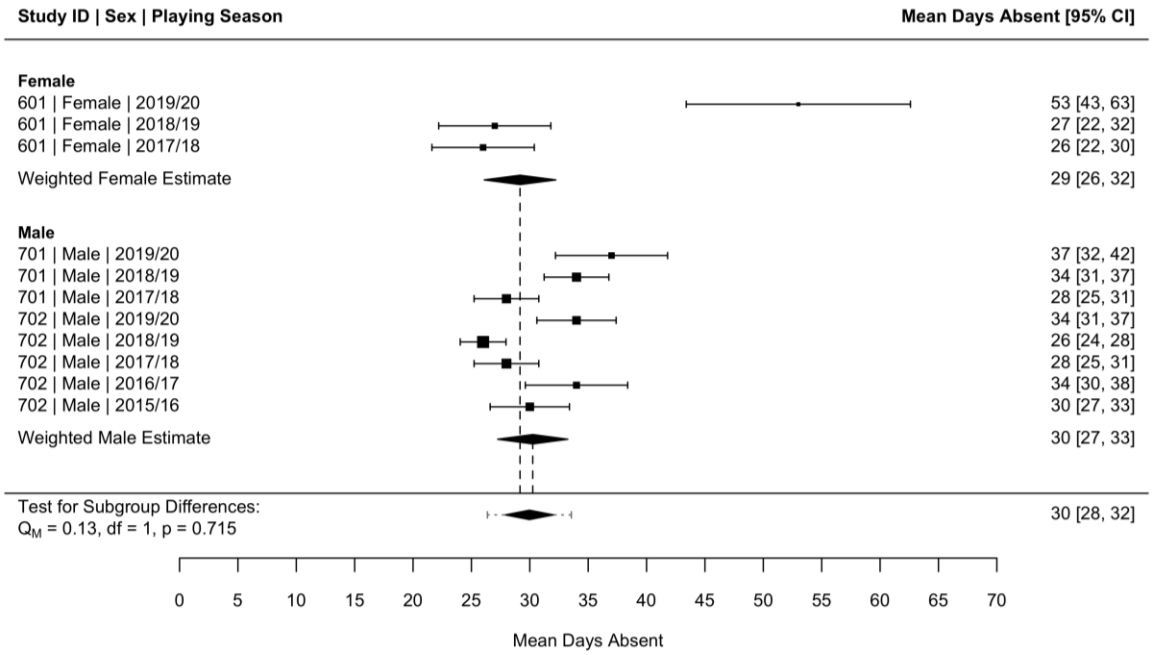

Figure 4b. *Forest Plot illustrating match concussion severity by individual studies, with weighted subset estimates for community senior female and male rugby. The centre of each diamond represents the estimated mean days absent, with the widths reflecting the precision of the estimates. The dashed 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.*

In senior rugby, the weighted match concussion severity estimate for female players (29 days, 95% CI 26 to 32), when combined with match injury incidence, equates to a burden of 161 days lost/1000 player-match-hours. In senior male rugby, weighted match concussion severity was estimated to be 30 days (95% CI 27 to 33), with a burden of 125 days lost/1000 player-match-hours. Biological sex did not significantly influence concussion severity (*P*=0.715).

Acknowledgements

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