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Epidemiology of Injuries in National Collegiate Athletic Association Women's Soccer: 2014–2015 Through 2018–2019

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Context: The National Collegiate Athletic Association held the first women's soccer championship in 1982; sponsorship and participation have greatly increased since.

Background: Routine examinations of athlete injuries are important for identifying emerging temporal patterns.

Methods: Exposure and injury data collected in the National Collegiate Athletic Association Injury Surveillance Program during the 2014–2015 through 2018–2019 seasons were analyzed. Injury counts, rates, and proportions were used to describe injury characteristics, and injury rate ratios were used to examine differential injury rates.

Results: The overall injury rate was 8.33 per 1000 athlete-exposures. Lateral ligament complex tears (ankle sprains) (8.6%), concussions (8.3%), and quadriceps tears (5.0%) were the most commonly reported injuries. Rates of lateral ligament complex tears followed an increasing trajectory during the study period, whereas quadriceps tear rates fluctuated during the early years, and concussion rates decreased then increased.

Summary: The findings of this study were mostly consistent with existing evidence; notable temporal patterns were observed with regard to lateral ligament complex tears and concussions.

Key Words: collegiate, sport-related, surveillance

Key Points

- Across the study period, the competition injury rate was consistently higher than the practice injury rate; competition injury rates also followed an increasing trajectory between 2014–2015 and 2018–2019.
- The overall preseason injury rate was higher than the regular season and postseason injury rates; however, postseason injury rates increased during 2016–2017 to 2018–2019 while preseason and regular season injury rates remained relatively stable during these years.
- Most injuries were classified as sprains, strains, or contusions; ankle sprains, concussions, and quadriceps tears were the most commonly reported specific diagnoses.

Soccer, known as one of the most popular sports internationally,[1,2] continues to grow in participation and circulates among communities of all demographics in the United States. Particularly during the years of 2014–2015 to 2018–2019, women's soccer has gathered further national attention, with a women's professional league gaining traction and the US women's national team winning a world cup in 2015.[3,4] Unsurprisingly, women's soccer has also continued to gain momentum at the collegiate level in recent years. In the 1981–1982 season, the National Collegiate Athletic Association (NCAA) reported only 80 women's soccer teams across all 3 divisions; that number has since dramatically increased to 1041 in the 2018–2019 season.[5] Further, the total number of women's soccer players increased from 26 995 in the 2014–2015 season to 28 310 in 2018–2019 season.[5] Given the high injury rates observed in women's soccer (relative to other NCAA women's sports),[6] the dynamics of the game, and the physical demands involved, it follows that studying injuries specific to women's soccer warrants due attention, as it can reveal relationships between injury incidence and their subsequent outcomes.

Surveillance systems are commonly used by researchers to observe evolving trends among large populations. Sports injury surveillances systems are essential for spawning new ideas related to injury patterns among athlete and sports injury-specific subgroups. The NCAA established an injury surveillance system in 1982,[7] which is now the NCAA Injury Surveillance Program (ISP), to capture exposures, mechanisms, and details related to the injury.[8] This compendium of deidentified data has been widely requested by researchers. Prior researchers using data collected by ISP to describe injuries in women's soccer have revealed notable findings.[9–12] Across all divisions, Dick et al[12] (using data captured by the NCAA ISP between 1988 and 2003) and DiStefano et al[11] (using data captured by the NCAA ISP between 2004 and 2014) observed greater injury rates during competition than during practice.[11,12] Roos et al[9] observed comparable estimates using data captured by NCAA ISP from 2009–2010 to 2014–2015. In these studies, researchers have also shown that although ankle,

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knee, and upper leg injuries remained the most common injuries among NCAA women's soccer players particularly in practices, head or face injuries were also commonly reported competition injuries in this group.[9,11,12] Notably, however, no researchers have examined the epidemiology of NCAA women's soccer injuries since 2015.

Updated epidemiological studies aid injury prevention efforts by describing emerging patterns in injury incidence, identifying the factors related to injury incidence, and informing strategies with the potential to reduce injury risk and severity.[13,14] It is particularly important to report trends in NCAA women's soccer-related injuries to better position athletic trainers and sports medical staff at member institutions to care for their student-athletes. Thus, the purpose of this study was to describe the epidemiology of women's soccer-related injuries captured by the NCAA ISP during the 2014–2015 to 2018–2019 athletic seasons.

METHODS

Study Data

Women's soccer-related exposure and injury data collected in the NCAA ISP during 2014–2015 to 2018–2019 were used in this analysis. NCAA ISP methods were reviewed and approved as an exempt study by the NCAA Research Review Board, and the methods of the surveillance program are detailed separately within this special issue.[15] In summary, athletic trainers at participating institutions contributed relevant injury and exposure data by using their clinical electronic medical record systems. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition and required medical attention by a team certified athletic trainer or physician (regardless of time loss [TL]). Scheduled team practices and competitions during the competitive season were considered reportable exposures for this study. Data from 29 (3% of membership) participating programs in 2014–2015, 24 (2% of membership) in 2015–2016, 36 (4% of membership) in 2016–2017, 46 (4% of membership) in 2017–2018, and 109 (11% of membership) in 2018–2019 qualified for inclusion in these analyses. Qualification criteria are detailed in the aforementioned methods manuscript.[15]

Statistical Analysis

Injury counts and rates (per 1000 AEs, for which 1 AE was defined as 1 athlete participating in 1 exposure event) were examined across event type (practice or competition), competition level (Division I, Division II, or Division III), season segment (preseason, regular season, or postseason), and TL (TL or non-TL [NTL]). Poststratification sample weights by sport and division are established within the ISP to compute national estimates of injury events based on the sampled teams; weighted and unweighted rates were estimated for this study, and results are presented in terms of unweighted rates (unless otherwise specified) due to low frequencies of injury observations across levels of certain explanatory variables. Temporal patterns in injury rates across the study period were evaluated using stratified (by levels of the aforementioned variables) rate profile plots. Similarly, temporal trends in rates of most commonly reported injuries were also examined across the study period. Injury counts and proportions were examined by TL (TL or NTL), body parts injured, mechanism of injury (player contact, surface contact, ball contact, other contact, noncontact, or overuse) injury diagnoses, playing positions (goalkeeper, defender, midfielder, forward, or striker), and activities. Injury rate ratios (IRRs) were used to examine differential injury rates across event types, competition levels, and season segments. IRRs with associated 95% confidence intervals (CIs) excluding 1.00 were considered statistically significant, and all analyses were conducted using SAS 9.4 (SAS Institute).

RESULTS

A total of 3932 women's soccer injuries from 454 330 AEs were reported to the NCAA ISP during the 2014–2015 to 2018–2019 athletic seasons (rate = 8.65 per 1000 AEs). This equated to a national estimate of 89 917 injuries overall (Table 1). The competition injury rate across the study period was higher than the practice injury rate (IRR = 2.81; 95% CI = 2.64, 2.99). Competition injury rates steadily increased across the study period, whereas practice injury rates remained relatively stable (Figure A). The overall Division II injury rate across the study period (rate = 9.55 per 1000 AEs) was higher than the Division I (rate = 7.48 per 1000 AEs), and Division III (rate = 9.26 per 1000 AEs) injury rates. Statistically significant differences were observed between the Division I and Division II rates (IRR = 0.78; 95% CI = 0.73, 0.84), as well as between the Division I and Division III rates (IRR = 0.81; 95% CI = 0.75, 0.87).

Injuries by Season Segment

During the 2014–2015 to 2018–2019 athletic seasons, 1114 preseason injuries (national estimate: 27 476), 2691 regular season injuries (national estimate: 60 097), and 127 postseason injuries (national estimate: 2344) were reported (Table 2). The preseason injury rate was higher than regular season (IRR = 1.16; 95% CI = 1.08, 1.24) and postseason (IRR = 1.58; 95% CI = 1.32, 1.90) injury rates. Preseason injury rates increased between 2014–2015 and 2015–2016, decreased between 2015–2016 and 2016–2017, and remained steady thereafter (Figure B). Conversely, regular season injury rates steadily increased across the study period, and postseason injury rates notably increased between 2016–2017 and 2018–2019 (Figure B).

Time Loss

Under one-half (39.0%) of all reported injuries resulted in TL of >1 day (TL was not reported in ~21% of all reported injuries). A comparable proportion of competition (39.4%) and practice (38.7%) injuries were TL injuries. Rates of competition-related TL rates generally increased across the study period (Figure C). Conversely, rates of practice-related TL injuries remained relatively steady across the study period (Figure C).

Injury Characteristics

Knee injuries (16.7%), ankle injuries (14.8%), and thigh injuries (14.7%) accounted for the largest proportions of all women's soccer injuries reported between 2014–2015

Table 1. Reported and National Estimates of Injuries, AEs, and Rates per 1000 AEs by Event Type Across Divisions[a]

	Number AEs Rate per 1000 AEs (95% CI)					
	Overall		Practices		Competitions	
Division	Reported	National Estimate	Reported number	National Estimate	Reported	National Estimate
I	1327	24 811	637	12 002	690	12 809
	177 438	3 631 565	135 222	2 797 053	42 216	834 512
	7.48 (7.08, 7.88)	6.83 (6.43, 7.23)	4.71 (4.34, 5.08)	4.29 (3.93, 4.66)	16.34 (15.12, 17.56)	15.35 (14.13, 16.57)
II	1374	27 014	745	14 618	629	12 397
	143 890	2 720 845	109 473	2 053 037	34 418	667 808
	9.55 (9.04, 10.05)	9.93 (9.42, 10.43)	6.81 (6.32, 7.29)	7.12 (6.63, 7.61)	18.28 (16.85, 19.70)	18.56 (17.14, 19.99)
III	1231	38 092	665	21 081	566	17 011
	133 002	4 441 904	97 391	3 262 511	35 611	1 179 393
	9.26 (8.74, 9.77)	8.58 (8.06, 9.09)	6.83 (6.31, 7.35)	6.46 (5.94, 6.98)	15.89 (14.58, 17.20)	14.42 (13.11, 15.73)
Overall	3932	89 917	2047	47 701	1885	42 217
	454 330	10 794 314	342 085	8 112 600	112 245	2 681 714
	8.65 (8.38, 8.93)	8.33 (8.06, 8.60)	5.98 (5.72, 6.24)	5.88 (5.62, 6.14)	16.79 (16.04, 17.55)	15.74 (14.98, 16.50)

Abbreviation: AEs, athlete-exposures.

[a] Data presented in the order of reported number, followed by athlete exposures (AEs), estimated injury rates, and associated 95% Confidence Intervals (CIs) for each cross-tabulation of division and event types. Data pooled association-wide are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. All CIs were constructed using variance estimates calculated on the basis of reported data. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

and 2018–2019 (Table 3). Head or face injuries were also common, particularly in competitions (17.0%). Notably, head or face injuries and ankle injuries accounted for larger proportions of competition injuries than practice injuries (Table 3). Conversely, hip or groin injuries and thigh injuries accounted for larger proportions of practice injuries than competition injuries (Table 3). Approximately one-third of all reported injuries were attributable to player contact mechanisms (29.2%); a larger proportion of all competition injuries (44.8%) than practice injuries (14.9%) were attributable to player contact mechanisms. Although notable proportions of all injuries were also attributable to noncontact (23.3%) and overuse (17.6%) mechanisms, both mechanisms accounted for larger proportions of practice-related injuries than competition-related injuries (Table 3).

Overall, most women's soccer injuries reported during the 2014–2015 to 2018–2019 seasons were strains (21.7%),

Table 2. Reported and National Estimates of Injuries, AEs, and Rates per 1000 AEs by Season Segment Across Divisions[a]

	Number AEs Rate per 1000 AEs (95% CI)					
	Preseason		Regular Season		Post Season	
Division	Reported	National Estimate	Reported	National Estimate	Reported	National Estimate
I	297	5894	988	18 153	42	763
	41 336	837 860	127 475	2 637 211	8627	156 494
	7.19 (6.37, 8.00)	7.03 (6.22, 7.85)	7.75 (7.27, 8.23)	6.88 (6.40, 7.37)	4.87 (3.40, 6.34)	4.88 (3.40, 6.35)
II	419	8364	916	18 180	39	471
	42 128	758 570	96 336	1 891 040	5426	71 235
	9.95 (8.99, 10.90)	11.03 (10.07, 11.98)	9.51 (8.89, 10.12)	9.61 (9.00, 10.23)	7.19 (4.93, 9.44)	6.61 (4.36, 8.87)
III	398	13 217	787	23 764	46	1111
	30 841	1 018 895	95 626	3 200 160	6536	222 848
	12.90 (11.64, 14.17)	12.97 (11.70, 14.24)	8.23 (7.65, 8.80)	7.43 (6.85, 8.00)	7.04 (5.00, 9.07)	4.99 (2.95, 7.02)
Overall	1114	27 476	2691	60 097	127	2344
	114 305	2 615 326	319 437	7 728 411	20 589	450 577
	9.75 (9.17, 10.32)	10.51 (9.93, 11.08)	8.42 (8.11, 8.74)	7.78 (7.46, 8.09)	6.17 (5.10, 7.24)	5.20 (4.13, 6.28)

Abbreviation: AEs, athlete-exposures.

[a] Data presented in the order of reported number, followed by athlete exposures (AEs), estimated injury rates, and associated 95% Confidence Intervals (CIs) for each cross-tabulation of division and season segments. Data pooled association-wide are presented overall, and separately for preseason, regular season, and post season. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. All CIs were constructed using variance estimates calculated on the basis of reported data. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

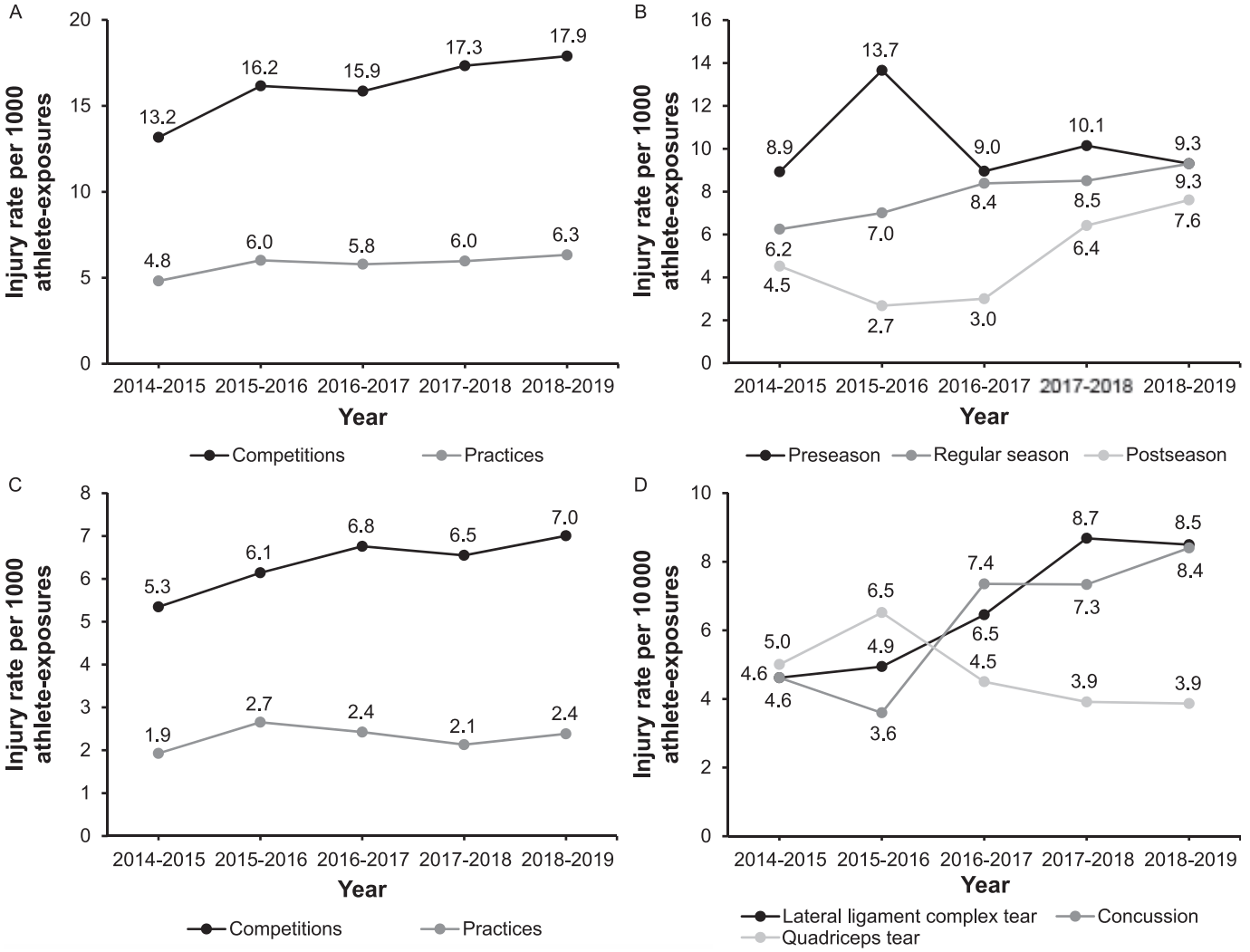

Figure. Temporal patterns in injury rates between 2014–2015 and 2018–2019. A, Overall injury rates (per 1000 AEs) stratified by event type (practices or competitions). B, Injury rates (per 1000 AEs) stratified by season segment. C, Rates (per 1000 AEs) of time loss injuries stratified by event type (practices or competitions). D, Rates (per 10 000 AEs) of most commonly reported injuries. All rates are unweighted and based on reported data.

sprains (21.6%), and contusions (12.5%). Inflammatory conditions (most reported in lower leg or Achilles, knee, or foot or toes; and at a markedly higher rate in preseason [rate = 1.43 per 1000 AEs] than in regular season [rate = 0.65 per 1000 AEs] and postseason [rate = 0.73 per 1000 AEs]) were also common overall (9.9%) and accounted for a notable proportion of practice injuries (14.1%). Sprains (most reported in lower knee and ankle) accounted for a larger proportion of competition injuries (26.5%) than practice injuries (17.0%). Similarly, a larger proportion of competition injuries (17.8%) than practice injuries (7.7%) were contusions. Conversely, strains accounted for a larger proportion of practice injuries (26.8%) than competition injuries (16.1%). The most commonly reported specific injuries during the study period were partial or complete lateral ligament complex tears (ankle sprains; 8.6%), concussions (8.3%), and partial or complete quadriceps tears (5.0%). Notably, partial or complete ACL tears accounted for 3.0% of all reported injuries during the study period. Rates of lateral ligament complex tears steadily increased throughout the study period (Figure D). Rates of concussion decreased between 2014–2015 and 2015–2016 and increased thereafter (Figure D), whereas rates of quadriceps tears fluctuated between 2014–2015 and 2016–2017 and remained stable thereafter (Figure D).

Injuries by Soccer-Specific Activities and Playing Positions

Most injuries in women's soccer during the 2014–2015 to 2018–2019 seasons occurred during general play (33.1%). Running (11.1%) and defending (10.5%) together accounted for over one-fifth of all reported injuries (Table 4). Comparable proportions of competition (32.3%) and practice (33.8%) injuries occurred during general play. Conversely, a larger proportion of practice injuries (13.8%) than competition injuries (8.2%) occurred during running, and a larger proportion of competition injuries (13.6%) than practice injuries (7.6%) was attributable to defending. With regard to playing position, injuries to midfielders accounted for the largest proportion of reported injuries during the study period (Table 4).

Table 3. Distribution of Injuries by Body Part, Mechanism, and Injury Diagnosis[a]

	Overall		Competitions		Practices	
	Injuries Reported, No. (%)	National Estimate, No. (%)	Injuries Reported, No. (%)	National Estimate, No. (%)	Injuries Reported, No. (%)	National Estimate, No. (%)
Body part						
Head/face	477 (12.13)	10 188 (11.33)	320 (16.98)	6700 (15.87)	157 (7.67)	3487 (7.31)
Neck	56 (1.42)	1269 (1.41)	36 (1.91)	783 (1.85)	20 (0.98)	486 (1.02)
Shoulder	87 (2.21)	2037 (2.27)	48 (2.55)	1209 (2.86)	39 (1.91)	828 (1.74)
Arm/elbow	56 (1.42)	1285 (1.43)	23 (1.22)	548 (1.30)	33 (1.61)	738 (1.55)
Hand/wrist	137 (3.48)	3006 (3.34)	72 (3.82)	1489 (3.53)	65 (3.18)	1517 (3.18)
Trunk	243 (6.18)	5786 (6.43)	103 (5.46)	2395 (5.67)	140 (6.84)	3391 (7.11)
Hip/groin	343 (8.72)	8170 (9.09)	110 (5.84)	2513 (5.95)	233 (11.38)	5657 (11.86)
Thigh	576 (14.65)	13 629 (15.16)	205 (10.88)	4633 (10.97)	371 (18.12)	8995 (18.86)
Knee	655 (16.66)	14 152 (15.74)	339 (17.98)	7374 (17.47)	316 (15.44)	6778 (14.21)
Lower leg	368 (9.36)	9005 (10.01)	151 (8.01)	3647 (8.64)	217 (10.60)	5358 (11.23)
Ankle	581 (14.78)	12 413 (13.80)	329 (17.45)	7194 (17.04)	252 (12.31)	5219 (10.94)
Foot	277 (7.04)	7062 (7.85)	130 (6.90)	3326 (7.88)	147 (7.18)	3737 (7.83)
Other	76 (1.93)	1915 (2.13)	19 (1.01)	404 (0.96)	57 (2.78)	1511 (3.17)
Mechanism						
Player contact	1149 (29.22)	25 210 (28.04)	844 (44.77)	18 477 (43.77)	305 (14.90)	6733 (14.12)
Surface contact	449 (11.42)	10 517 (11.70)	241 (12.79)	5403 (12.80)	208 (10.16)	5114 (10.72)
Ball contact	381 (9.69)	8008 (8.91)	181 (9.60)	3796 (8.99)	200 (9.77)	4212 (8.83)
Other contact	26 (0.66)	479 (0.53)	14 (0.74)	292 (0.69)	12 (0.59)	186 (0.39)
Noncontact	914 (23.25)	23 572 (26.22)	320 (16.98)	8300 (19.66)	594 (29.02)	15 273 (32.02)
Overuse	691 (17.57)	15 733 (17.50)	147 (7.80)	3162 (7.49)	544 (26.58)	12 571 (26.35)
Other/unknown	322 (8.19)	6399 (7.12)	138 (7.32)	2787 (6.60)	184 (8.99)	3612 (7.57)
Diagnosis						
Abrasion/laceration	59 (1.50)	1278 (1.42)	51 (2.71)	1086 (2.57)	8 (0.39)	192 (0.40)
Concussion	325 (8.27)	6868 (7.64)	208 (11.03)	4314 (10.22)	117 (5.72)	2554 (5.35)
Contusion	492 (12.51)	11 370 (12.64)	335 (17.77)	7448 (17.64)	157 (7.67)	3922 (8.22)
Dislocation/subluxation	56 (1.42)	1316 (1.46)	35 (1.86)	794 (1.88)	21 (1.03)	522 (1.09)
Fracture	97 (2.47)	2305 (2.56)	65 (3.45)	1580 (3.74)	32 (1.56)	725 (1.52)
Illness/infection	6 (0.15)	139 (0.15)	4 (0.21)	122 (0.29)	2 (0.10)	17 (0.04)
Inflammatory condition	388 (9.87)	8902 (9.90)	100 (5.31)	2354 (5.58)	288 (14.07)	6548 (13.73)
Spasm	250 (6.36)	5380 (5.98)	78 (4.14)	1620 (3.84)	172 (8.40)	3760 (7.88)
Sprain	848 (21.57)	18 445 (20.51)	500 (26.53)	10 975 (26.00)	348 (17.00)	7469 (15.66)
Strain	852 (21.67)	21 345 (23.74)	303 (16.07)	7415 (17.56)	549 (26.82)	13 930 (29.20)
Other	559 (14.22)	12 569 (13.98)	206 (10.93)	4508 (10.68)	353 (17.24)	8061 (16.90)

[a] Data presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

SUMMARY

In this study, we aimed to describe the epidemiology of soccer-related injuries among NCAA women's soccer players during the 2014–2015 through 2018–2019 athletic seasons. The competition injury rate was higher than the practice injury rate across the study period. Although this finding consistent with the existing literature in this population,[11,12] the competition injury rate notably followed an increasing pattern throughout the study period. In comparison, the practice injury rate remained relatively stable, and therefore, the trajectory of competition injury rates after 2018–2019 warrants targeted monitoring. With regard to season segment, although preseason injury rates were higher than regular and postseason injury rates across the study period overall, postseason injury rates offered a notable juxtaposition to preseason and regular season injury rates during 2016–2017 to 2018–2019. Previous studies have shown higher injury rates in preseason in comparison with regular and postseason, in this group.[11,12] The sharp increase in postseason injury rates indicate that postseason injuries may merit targeted attention in the years after 2018–2019 and present an avenue for detailed examinations in the future. In doing so, it is important to acknowledge the nuances of the collegiate soccer competitive season and carefully consider the composition of exposure events at various phases of the season. Future researchers conducting targeted, small-sample studies to examine postseason injuries more closely may consider factors such as fixture density (volume of games over a given time period) and acute cumulative workload to better reconcile postseason injury risk within this population.

Sprains, strains, and contusions were the most commonly reported injury diagnoses in NCAA women's soccer during 2014–2015 to 2018–2019. Notably, inflammatory conditions were also common and accounted for a higher proportion of practice injuries than contusions. While previous studies have also noted that most injuries in this population are sprains, strains, or contusions, there has been relatively less discussion surrounding inflammatory condi-

Table 4. Distribution of Injuries by Injury Activity and Playing Position[a]

	Overall		Competitions		Practices	
	Injuries Reported, No. (%)	National Estimate, No. (%)	Injuries Reported, No. (%)	National Estimate, No. (%)	Injuries Reported, No. (%)	National Estimate, No. (%)
Activity						
On the ball	75 (1.91)	1876 (2.09)	42 (2.23)	995 (2.36)	33 (1.61)	881 (1.85)
Blocking shot	120 (3.05)	2999 (3.34)	59 (3.13)	1425 (3.38)	61 (2.98)	1574 (3.30)
Conditioning	77 (1.96)	2085 (2.32)	1 (0.05)	34 (0.08)	76 (3.71)	2051 (4.30)
Set pieces	70 (1.78)	1542 (1.71)	33 (1.75)	634 (1.50)	37 (1.81)	908 (1.90)
Defending	413 (10.50)	9134 (10.16)	257 (13.63)	5484 (12.99)	156 (7.62)	3650 (7.65)
General play	1300 (33.06)	29 815 (33.16)	609 (32.31)	13 777 (32.63)	691 (33.76)	16037 (33.62)
Goalkeeping	256 (6.51)	6314 (7.02)	100 (5.31)	2605 (6.17)	156 (7.62)	3710 (7.78)
Heading	178 (4.53)	3732 (4.15)	141 (7.48)	3004 (7.12)	37 (1.81)	728 (1.53)
Loose ball	112 (2.85)	2329 (2.59)	73 (3.87)	1608 (3.81)	39 (1.91)	721 (1.51)
Passing	78 (1.98)	1840 (2.05)	25 (1.33)	683 (1.62)	53 (2.59)	1156 (2.42)
Receiving	59 (1.50)	1240 (1.38)	31 (1.64)	667 (1.58)	28 (1.37)	573 (1.20)
Running	437 (11.11)	11 135 (12.38)	155 (8.22)	3607 (8.54)	282 (13.78)	7528 (15.78)
Finishing	152 (3.87)	3415 (3.80)	51 (2.71)	1188 (2.81)	101 (4.93)	2227 (4.67)
Slide tackling	180 (4.58)	3563 (3.96)	147 (7.80)	2929 (6.94)	33 (1.61)	634 (1.33)
Other/unknown	425 (10.81)	8898 (9.90)	161 (8.54)	3576 (8.47)	264 (12.90)	5322 (11.16)
Position						
Goalkeeper	432 (10.99)	10 549 (11.73)	163 (8.65)	3994 (9.46)	269 (13.14)	6555 (13.74)
Defender	1096 (27.87)	24 296 (27.02)	570 (30.24)	12 521 (29.66)	526 (25.70)	11 775 (24.69)
Midfielder	1205 (30.65)	28 132 (31.29)	588 (31.19)	13 635 (32.30)	617 (30.14)	14 497 (30.39)
Forward/striker	955 (24.29)	21 790 (24.23)	503 (26.68)	10 992 (26.04)	452 (22.08)	10 799 (22.64)
Other/unknown	244 (6.21)	5149 (5.73)	61 (3.24)	1074 (2.54)	183 (8.94)	4075 (8.54)

[a] Data presented in the order of reported number, followed by the proportion of all injuries attributable to a given category. Data pooled across event types are presented overall, and separately for practices and competitions. National estimates were produced using sampling weights estimated on the basis of sport, division, and year. A reportable injury was one that occurred due to participation in an organized intercollegiate practice or competition, and required medical attention by a team Certified Athletic Trainer or physician (regardless of time loss). Only scheduled team practices and competitions were retained in this analysis.

tions in NCAA women's soccer players.[11,12] Although the rate of inflammatory conditions was higher in preseason than it was in regular season and postseason, it is difficult to draw nuanced inferences about the nature of the inflammatory conditions reported within the ISP given the nature of sports injury surveillance data. In future targeted studies of soccer-related injuries among elite and collegiate women's soccer players, researchers may seek to capture more granular athlete and injury information to better characterize the risk of and recovery after inflammatory conditions within this population.

The most common specific injuries reported during the study period were partial or complete lateral ligament complex tears (ankle sprains), concussions, and partial or complete quadriceps tears. Incidence trajectories of concussions as well as lateral ligament complex tears across the study period indicate the need for further monitoring of these specific injuries in this population. In the case of lateral ligament complex tears, although injury rates remained stable during 2017–2018 to 2018–2019, incidence rates sharply increased across the entirety of the study period. Previous researchers have shown that lateral ligament complex tears are common in this group.[16] Although some ankle injury prevention strategies have shown promising results,[17–21] athlete behavior and preferences are important considerations in the development of such strategies;[22] and it may be critical to further prioritize the primary prevention of such injuries in this group considering the incidence trajectories observed here. Similarly, concussions rates also sharply increased during 2015–2016 to 2018–2019. Concussion rates in women's soccer have been previously reported to be among the highest within all NCAA women's sports.[10] Researchers have also indicated sex differences in concussion sequelae among soccer players, suggesting that outcomes following concussions are more deleterious among women's soccer players than their male counterparts.[23,24] Previous researchers have posited reasons for the observed sex differences in concussion incidence,[24–28] although it is important to continue examining the interplay between clinical presentations and the physiological and biomechanical underpinnings of concussions to better understand concussion risk and its associated effect on the quality of life among women's soccer players. Importantly, although these incidence trajectories offer a valuable insight into the incidence of commonly observed injuries among NCAA women's soccer players, it is reasonable to exercise caution while drawing inferences based on the observed trajectories. In particular, it is important to juxtapose these patterns to ISP participation noted previously in this article. ISP participation among NCAA women's soccer programs continuously improved throughout the study period; although it markedly improved between 2016–2017 and 2018–2019. With that said, it is reasonable to suggest that the latter years of this study period offer a more stable estimation, as well as a better representation of injury incidence in this population (compared with the earlier years). It follows that, under the tacit assumption of continued improvements in ISP participation, the incidence trajectories of these specific injuries warrant close monitoring after 2018–2019 to

better understand the burden posed by them to this population.

Routine monitoring of NCAA women's soccer injuries is important and will provide valuable insight into injury incidence and outcomes within this population. Here, we show that although injury incidence was temporally stable within this population in some regard, routine surveillance has the capacity to highlight emerging patterns. Ultimately, these emerging patterns offer the platform upon which to build targeted studies in which researchers reconcile the etiology underpinning injury risk and sequelae in this group.

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