

THE NATIONAL INTERSCHOLASTIC CYCLING ASSOCIATION SAFETY REPORT

2021

In partnership with University of Utah Sports Medicine



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INTRODUCTION

PREAMBLE:

The National Interscholastic Cycling Association (NICA) is committed to protecting the safety of everyone participating in interscholastic mountain bike programs. To this aim, NICA and its partners at the University of Utah have collaborated to establish the NICA Safety Report. The Safety Report is designed to better understand the types and causes of injuries seen in middle and high school mountain biking, and to pursue data-driven strategies to protect the safety of student-athletes, coaches, officials and fans.

The NICA Safety Report solicits and welcomes input from all stakeholders, including student-athletes, coaches, parents, race staff and others.

After nearly three years of project development, consultation with leading sports epidemiologists around the world and extensive beta testing, the NICA Safety Report formally started in the 2018 season. Because of the dedication and commitment of many individuals, the first four years of data collection for the NICA Safety Report have been successful. The NICA Safety Report is the largest and most comprehensive mountain biking injury surveillance system in the world. The NICA Safety Report is also the first sports injury surveillance system to track injuries among coaches. With the knowledge gained from these efforts, NICA is leading the way to make the sport of mountain biking safer, and to protect the health of the student-athletes and all others involved in this sport.

This document is the 4th annual official NICA Safety Report and includes data from the 2021 spring and fall leagues. The annual NICA Safety Reports are made publicly available on the NICA website at <https://www.nationalmtb.org/safety-reporting/>. These reports will ultimately include results of injury reduction interventions. This year's report includes the results of the first injury reduction strategy on page 19.

***“...to pursue data-driven strategies
to protect
the safety of student-athletes...”***

Protection of Personal Information:

NICA and its partners take protection of personal information very seriously. All of the information used in the NICA Safety Report is always protected to the greatest degree possible. The NICA Safety Report meets or exceeds all national and local standards for the protection of personal information. All injury incident reports are only visible to NICA national staff, league staff, and NICA's insurance broker. NICA and its partners will never release an individual's personal health information without their formal permission. NICA's partners at the University of Utah never see any information that can personally identify individuals. All data is de-identified and analyzed in aggregate, making it impossible to identify any individual in the final analyses.

DEFINITIONS

Injury Definition: Injury is defined as any physical event that occurs during a NICA sanctioned team practice, race, coaches training session or camp that results in physical harm to the participant significant enough to:

1) Warrant referral to a medical provider

OR

2) Lose time from training or competition beyond the day of injury

OR

3) Miss school or work

Notes regarding Injury Definition:

- If an injury event does not result in an injury that meets one or more of the above criteria, then the injury event should not be entered into the NICA Safety Report database.
- If a rider is seen in the medical tent in the Pit Zone of a race, but otherwise none of the above 3 parameters are met, the injury event does not warrant inclusion in the injury database.

Injury Event: An injury event is a single event that caused one or more injuries meeting the above injury definition. In the majority of cases, an injury event is due to a crash or collision while riding. Less commonly in mountain biking, an injury may be the result of chronic overload to a body part; for example, the gradual onset of tendinitis in the knee.

Note regarding Injury Event Definition: A single injury event can result in more than one unique injury. For example, a rider might be involved in a crash that results in both a hip contusion (i.e., bruise) and a fracture of the clavicle (i.e., broken collarbone).

Designated Reporter: The Designated Reporter is the individual from each team who completes the weekly exposure reports and completes the injury report forms. Designated Reporters receive training on how to correctly report injuries.





*...strong minds,
bodies, character...*

Exposure Reporting: The total amount that an athlete is exposed to the risk of injury is a very important parameter in sports epidemiology. Exposure can be estimated in many different ways. In order to obtain an estimate of how much student-athletes are exposed to risk, the NICA Safety Report asks the Designated Reporters to provide the following information on a weekly basis:

1) How many NICA-sanctioned races, practices and other activities their team participated in each week

AND

2) How many student-athletes participated in each team race, practice and other activities.

This information provides the total number of student-athlete exposures.

Injury Event Proportion: The injury proportion is the number of injury events in one year divided by 100 participating riders. The injury proportion is expressed as a percentage.

Injury Proportion: The injury proportion is the number of unique injuries in one year divided by 100 participating riders. The injury proportion is expressed as a percentage. Because riders often sustain more than one injury per crash, the injury proportion is higher than the injury event proportion.

Injury Incidence: The injury incidence is the number of injury events per student-athlete exposure. In sports epidemiology, injury incidence is often considered more important than injury proportion because it takes into account how much exposure a student-athlete has to risk. Injury incidence can be reported in many different ways. Some common examples include:

- the number of student-athlete injuries per 1,000 student-athlete practices plus races;
- the number of student-athlete injuries per 1,000 student-athlete practices;
- the number of student-athlete injuries per 1,000 student-athlete races.

Note regarding exposure and injury incidence: During the first four years (2018, 2019, 2020, and 2021) of the NICA Safety Report, exposure reporting was insufficient to calculate injury incidences with confidence. Therefore, injury incidences are not included in this report. NICA is pursuing ongoing efforts to improve the reporting of injury incidence. Compliance with injury reporting has increased from ~40% to ~70% over 4 years, with a goal of reaching 90%.

Student-Athlete: The term student-athlete refers to any youth who has registered and paid for a given season in the NICA Pit Zone with the intent of participating in NICA programs.

Coach: The term coach refers to adults who have registered and paid for a given season in the NICA Pit Zone with the intent to coach for NICA programs.

Category: The term category refers to a group of student athletes defined by grade-level, division, sex and/or ability.

NICA SAFETY REPORT TEAM



Chris Spencer

Director of Outcomes, Risk and Safety

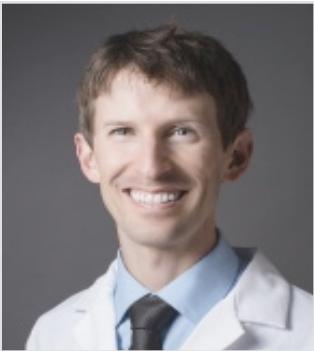
Chris is a proud NorCal League Alumni. Since 2009, he has worked for the NorCal League and then the NICA national office. Chris has had many roles at NICA with his primary contributions being the development and refinement of the risk management and training programs. The focus of his post-high school education has been economics, project management, counseling, program development, and risk management. Chris brings a wide range of experience including work as a bike mechanic, deckhand-engineer on tug boats, aviation and maritime insurance adjuster, comedian, residential advisor, outside salesman, and marketing representative.



Stuart Willick, MD

Professor, Sports Medicine, University of Utah

Stuart Willick, MD is a sports medicine physician who has worked with numerous elite sports organizations, including the University of Utah, the United States Ski and Snowboard Association, US Speedskating, the US Bobsled and Skeleton Federation, USA Climbing and the International Olympic and Paralympic Medical Committees. Dr. Willick helps athletes of all ages recover from their sports injuries and stay healthy and active. His research focus is the prevention of injury and illness in sport.



Dan Cushman, MD

Associate Professor, Sports Medicine, University of Utah

Dan Cushman, M.D., is board-certified in both Sports Medicine and Physical Medicine & Rehabilitation, and specializes in the care of musculoskeletal injuries in both athletes & non-athletes, musculoskeletal ultrasound, electrodiagnostics, and endurance sports-specific injuries with a particular interest in runners, cyclists, swimmers, and triathletes. He is Director of Sports Medicine Research at the University of Utah.



Sarah Thomson

Project Manager

Sarah is a Bay Area native, growing up in Menlo Park and attending UC Santa Cruz where she earned a degree in Marine Biology. She has been a competitive fencer for over 15 years and has worked with fencing clubs and leagues for over 10 years. Sarah was excited to join NICA and bring her extensive experience with fencing tournaments and registration to her new role. In her spare time, she likes to read, in particular murder mysteries.



Masaru Teramoto, PhD, MPH

Research Associate Professor, Sports Medicine, University of Utah

Masaru (Masa) Teramoto, PhD, MPH, PStat®, is a Research Associate Professor in the Division of Physical Medicine & Rehabilitation at University of Utah. He is a member of the American Statistical Association (ASA), and is an ASA Accredited Professional Statistician®. His research focuses on sports/exercise epidemiology and sports analytics.



Jerel Wilson

Senior Training Manager



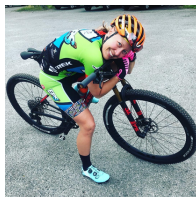
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“Every youth is empowered to be part of a thriving and engaged cycling community”



DATA SECTION A: 2021 STUDENT-ATHLETE INJURY DATA

2021 Student-Athletes Summary

2021 student-athletes summary	n	%
Total n of student-athletes Nationwide:	26,942	
Total n of male student-athletes Nationwide:	21,345	79.23%
Total n of female student-athletes Nationwide:	5,597	20.77%
Total number of student-athletes by Division		
Middle school	10,406	
Freshman	4,949	
Sophomore	1,009	
Junior varsity	8,185	
Varsity	752	
n and % of injured student-athletes Nationwide:	513	1.90%
n and % of injured male student-athletes Nationw	387	1.81%
n and % of injured female student-athletes Nation	122	2.18%
Number and % of injured student-athletes by Division		
Middle school	194	1.86%
Freshman	103	2.08%
Sophomore	45	4.46%
Junior varsity	148	1.81%
Varsity	22	2.93%

Table A1. 2021 student-athlete summary data. The percentages refer to the number of injury events per 100 student-athletes in each category.

Percent of Injury Events by Race Category

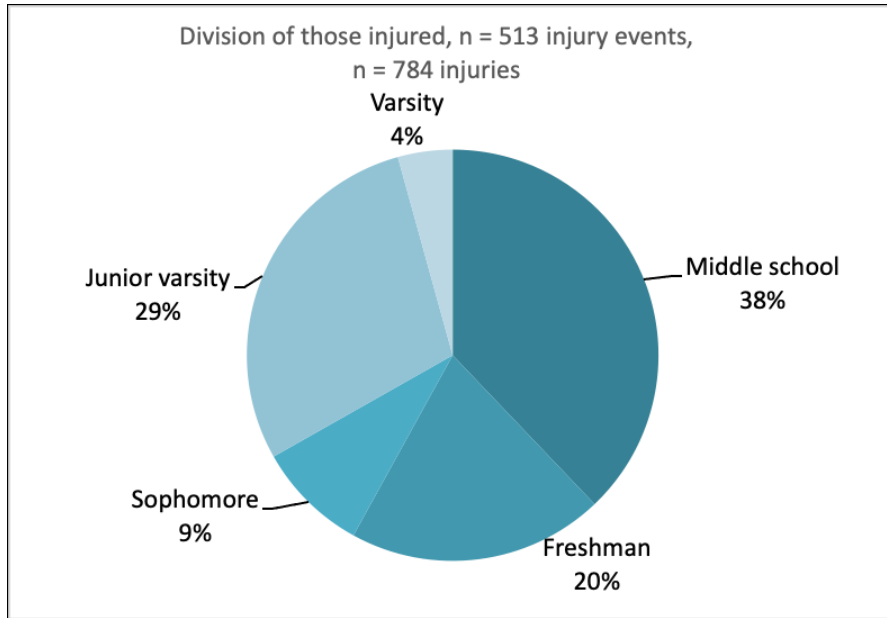


Figure A1. Percent of injury events by race category. The percentages refer to the number of injured student-athletes per total number of student-athletes participating in all categories together. The Varsity Division has the fewest number of participants overall, while the Middle School Division has the greatest number of participants overall.

Injury Proportion by Race Division

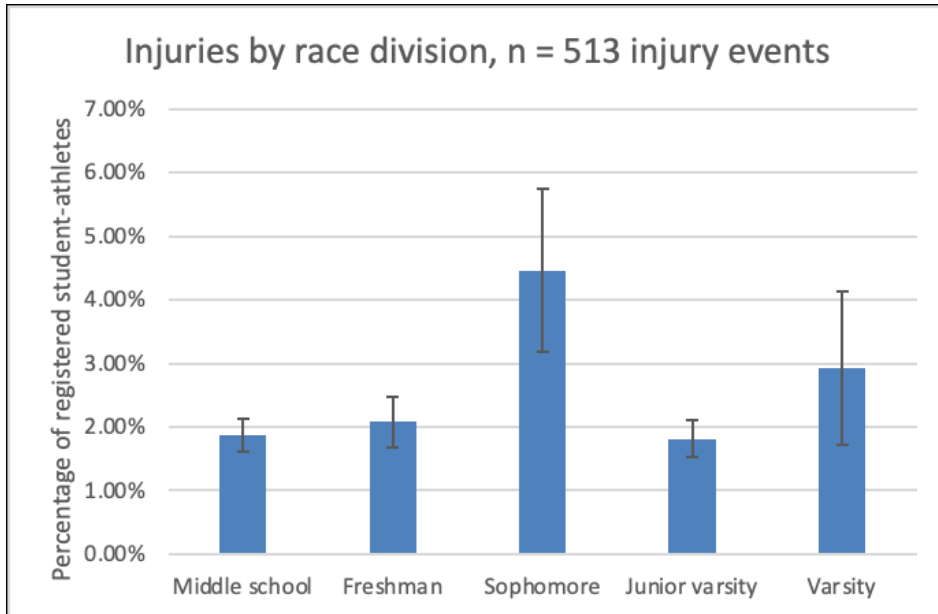


Figure A2. Injury proportion by race category. The thin, vertical black lines are confidence intervals. Where there is no overlap of the confidence intervals between two different bars, it means that the differences between the bars is statistically significant. Riders in the Sophomore Division have the highest injury proportion compared with all other Divisions.

Student-Athlete Injuries by Body Part

Which body part(s) did the student-athletes injure?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Head/brain	110	21.4%	82	21.2%	27	22.1%
Head/superficial	23	4.5%	19	4.9%	4	3.3%
Face	51	9.9%	41	10.6%	10	8.2%
Neck	11	2.1%	8	2.1%	3	2.5%
Shoulder	86	16.8%	68	17.6%	17	13.9%
Arm	29	5.7%	22	5.7%	7	5.7%
Elbow	45	8.8%	34	8.8%	11	9.0%
Forearm	72	14.0%	56	14.5%	16	13.1%
Wrist/hand	125	24.4%	104	26.9%	20	16.4%
Thoracic	7	1.4%	7	1.8%	0	0.0%
Lumbar	8	1.6%	7	1.8%	1	0.8%
Abdomen/chest	29	5.7%	20	5.2%	9	7.4%
Pelvis/hip	35	6.8%	21	5.4%	14	11.5%
Thigh	20	3.9%	13	3.4%	6	4.9%
Knee	63	12.3%	48	12.4%	15	12.3%
Leg	29	5.7%	26	6.7%	3	2.5%
Foot/ankle	23	4.5%	15	3.9%	8	6.6%
Other	18	3.5%	12	3.1%	6	4.9%
Total # and % of injuries	784	152.8%	603	155.8%	177	145.1%

Table A2. Student-athlete injuries by body part. The first category, “Head/brain,” refers to concussions. The second category, “Head/superficial” refers to other injuries to the head and face, such as abrasions (scrapes), but without a concussion. The total number of injuries (784) is greater than the total number of injury events listed in Table 1 (513) because a single injury event can result in more than one injury.



Student-Athlete Injuries by Body Part

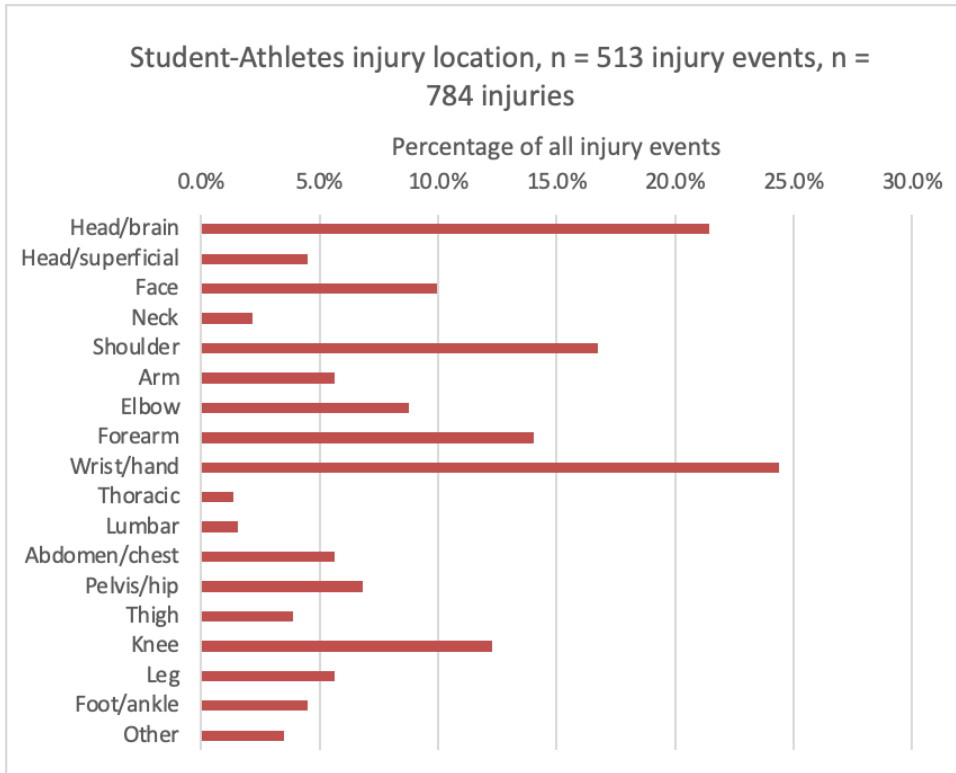


Figure A3. Bar chart representation of the same information presented in Table A2.

Student-Athlete Injury Diagnosis, Excluding Concussions

What was the diagnosis?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Contusion	78	15.2%	56	14.5%	22	18.0%
Abrasion	119	23.2%	94	24.3%	24	19.7%
Laceration	78	15.2%	60	15.5%	17	13.9%
Ligament sprain	50	9.7%	38	9.8%	12	9.8%
Muscle/tendon strain	21	4.1%	15	3.9%	6	4.9%
Fracture	158	30.8%	133	34.4%	25	20.5%
Dislocation	13	2.5%	8	2.1%	4	3.3%
Unknown	37	7.2%	31	8.0%	5	4.1%
Other	35	6.8%	25	6.5%	10	8.2%
Total # and % of injuries	589	114.8%	460	118.9%	125	102.5%

Table A3. Number and percentage of student-athlete injuries by type of injury, excluding concussions. There were a high number of relatively mild injuries such as contusion (bruise) and abrasion (scrape). However, there were also a high number of more significant injuries such as dislocation (displaced joint) and laceration (cut). The total number of diagnoses (623) is greater than the total number of injury events listed in Table 1 (513) because a single injury event can result in more than one type of injury.

Student-Athlete Injury Diagnosis

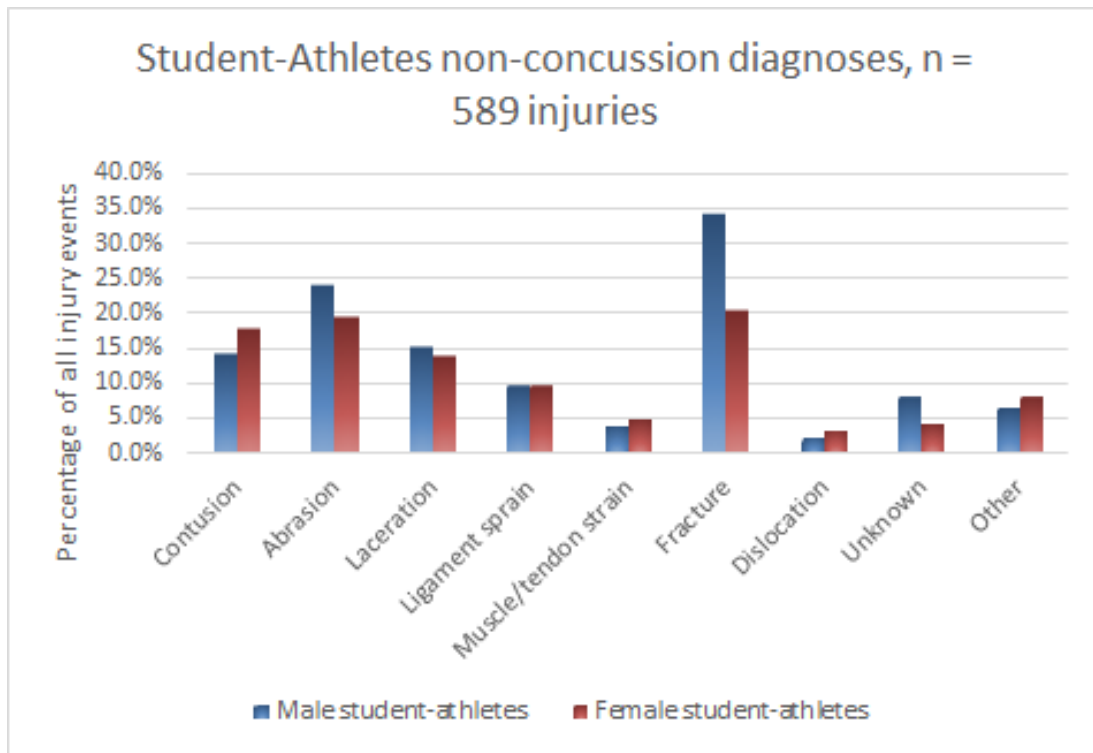


Figure A4. Bar chart representation of the same information presented in Table 3: percentage of injury types in male and female student-athletes. The total number of non-concussion diagnoses (623) is greater than the total number of injury events listed in Table 1 (513) because a single injury event can result in more than one type of injury.



Injured Student-Athletes Who Were and Were Not Able to Complete the Training Session or Race

Were the student-athletes able to complete the training session or race?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Completed	129	25.1%	98	25.3%	31	25.4%
Did not complete	376	73.3%	281	72.6%	91	74.6%
Total	505	98.4%	379	97.9%	122	100.0%

Table A4. Number and percentage of student-athletes who were and were not able to complete their practice ride or race after a reportable injury. The injury events in which the student-athlete was able to complete the training session or race likely resulted in less severe injuries to the student-athlete compared with the injury events in which the student-athlete was unable to complete the training session or race.

Mode of Transportation From Injury Site

How were the student-athletes transported from the site where the injury occurred?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Ambulance	25	4.9%	22	5.7%	3	2.5%
Helicopter	4	0.8%	3	0.8%	1	0.8%
Private vehicle	13	2.5%	7	1.8%	6	4.9%
ATV	39	7.6%	30	7.8%	9	7.4%
Other	5	1.0%	3	0.8%	2	1.6%
Total	86	16.8%	65	16.8%	21	17.2%

Table A5. Number and percentage of all injured student-athletes who required transport from the site of an injury. Only 16.8% of all injured student-athletes required assisted transportation from the injury site.

Disposition Following Injury

Disposition following injury	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Did not go to emergency room (ER)	219	42.7%	151	39.0%	66	54.1%
Went to ER, then sent home	243	47.4%	190	49.1%	51	41.8%
Went to ER, then admitted to hospital	18	3.5%	17	4.4%	1	0.8%
Unknown	31	6.0%	28	7.2%	3	2.5%
Total	511	99.6%	386	99.7%	121	99.2%

Table A6. Disposition of injured student-athletes. About half of all injured student-athletes sought emergency evaluation, but only a small percentage (3.5%) of injured student-athletes required admission to the hospital.

Type of Activity during which Injury Occurred

At which type of ride did the injury occur?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Team practice (on mountain bike trails)	302	58.9%	231	59.7%	68	55.7%
Race	130	25.3%	94	24.3%	36	29.5%
Team practice (riding on paved roads)	19	3.7%	14	3.6%	5	4.1%
Team practice (skills training)	21	4.1%	17	4.4%	4	3.3%
NICA On-the-Bike Skills	0	0.0%	0	0.0%	0	0.0%
Total	472	92.0%	356	92.0%	113	92.6%

Table A7. Type of ride or other NICA sanctioned activity at which student-athletes were injured. 58.9% of all injury events occurred during practice rides on mountain bike trails. 25.3% of all injury events occurred during races. The high percentage of injury events that occurred during practice rides likely reflects the fact that student-athletes are exposed to more practice rides than other types of rides, including races. Not all student-athletes participate in their League's race series. As exposure reporting improves, the NICA Safety Report will be better able to calculate injury incidence by factoring in exposure.

Trail Familiarity

Was the venue or route familiar to the injured rider?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Yes, the rider had ridden on this trail	374	72.9%	284	73.4%	88	72.1%
No, the rider had not ridden on this trail	101	19.7%	73	18.9%	26	21.3%
N/A or unsure	37	7.2%	29	7.5%	8	6.6%
Total	512	99.8%	386	99.7%	122	100.0%

Table A8. Trail familiarity at time of injury event: The majority of injuries (72.9%) occurred on a trail that was familiar to the student-athlete. The high percentage of injury events that occurred on trails with which the student-athlete was familiar may reflect the greater amount of time spent riding on familiar trails, as opposed to time spent riding on unfamiliar trails. Alternatively, these data could indicate that student-athletes take more risk when riding on familiar trails versus unfamiliar trails.

Trail Incline

What was the trail incline where the injury occurred?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Uphill / ascending	25	6.0%	17	5.2%	8	8.4%
Flat	121	28.8%	92	28.3%	29	30.5%
Downhill / descending	239	56.9%	187	57.5%	52	54.7%
Total	385	91.7%	296	91.1%	89	93.7%

Table A9. Incline of trail at time of injury: Over one-half (56.9%) of injury events occurred when riding on downhill sections of trail. 28.8% of injury events occurred on flat section of trails, and 6.0% occurred on uphill sections.

Time Off Due to Injury

Time lost from injury for student-athletes	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Less than 1 week	158	34.0%	120	34.3%	38	34.2%
1-2 weeks	103	22.2%	73	20.9%	28	25.2%
2-4 weeks	62	13.3%	42	12.0%	20	18.0%
At least 4 weeks	142	30.5%	115	32.9%	25	22.5%
Total	465	100.0%	350	100.0%	111	100.0%

Table A10. Time lost from injury. Over a third (34.0%) of injuries resulted in less than a week off the bike. Nearly as many (30.5%) injuries resulted in more than a month off the bike.

Time Off Due to Injury

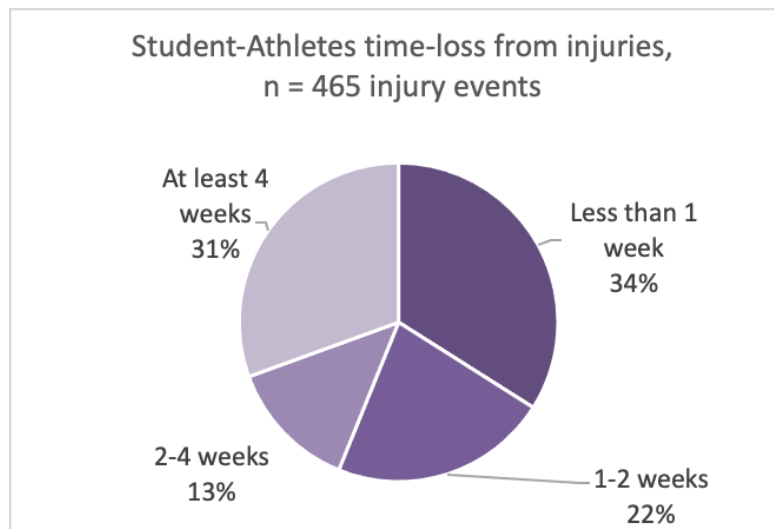


Figure A6. Pie chart representing percentages of time that student-athletes lost from practices and races following an injury event. This pie chart contains the same information as in Table A11.

Injury Reporting Access

Links clicked for student-athletes	All student-athletes	
	n	%
NICA website	166	32.4%
Blank field from email	35	6.8%
Unique field from email	312	60.8%
Total	513	100.0%

Table A11. How the injury reporting form was accessed. Completing the injury reporting form directly from the unique student-athlete link in the weekly email is strongly preferred because the student-athlete's demographic information is pre-populated in the form and because the injury reporting form accessed from the weekly email decreases the amount of missing and/or inaccurate data.

Student-Athlete Factors Associated with Injury

Were any of the following internal conditions associated with the injury?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Dehydration	3	0.6%	0	0.0%	3	2.5%
Lack of sleep	1	0.2%	1	0.3%	0	0.0%
Improper nutrition	4	0.8%	2	0.5%	2	1.6%
Illness at time of the ride	1	0.2%	0	0.0%	1	0.8%
Rider too hot	4	0.8%	4	1.0%	0	0.0%
Rider too cold	0	0.0%	0	0.0%	0	0.0%

Table A12. Student-athlete conditions that were felt to contribute to the injury event. These include preventable conditions including dehydration, lack of sleep, improper nutrition and medical illness at the time of the ride. The low numbers reflect the impression that the above factors were not associated with many injuries.

Other Factors Associated with Injury

Were any of the following external conditions associated with the injury?	All student-athletes		Male student-athletes		Female student-athletes	
	n	%	n	%	n	%
Injury occurred on a turn	104	20.3%	74	19.1%	29	23.8%
Weather	8	1.6%	7	1.8%	1	0.8%
Passing	36	7.0%	25	6.5%	10	8.2%
Mechanical	11	2.1%	7	1.8%	4	3.3%
Technical nature of trail	135	26.3%	108	27.9%	26	21.3%
Inexperience	106	20.7%	76	19.6%	27	22.1%
Nothing	206	40.2%	155	40.1%	51	41.8%
Loss of concentration	23	4.5%	19	4.9%	4	3.3%
Other	66	12.9%	51	13.2%	14	11.5%

Table A13. Riding factors that were felt to contribute to the injury event. Technical trails, rider inexperience and negotiating turns were all felt to contribute to injury events.



Injuries by Division in Races versus Practices

Races

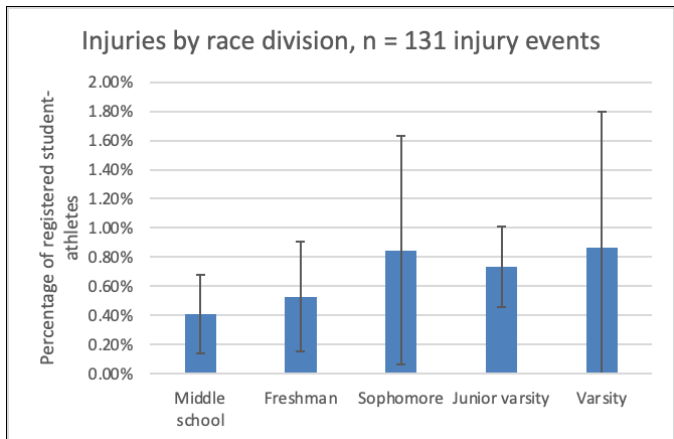


Figure A7a.

Practices

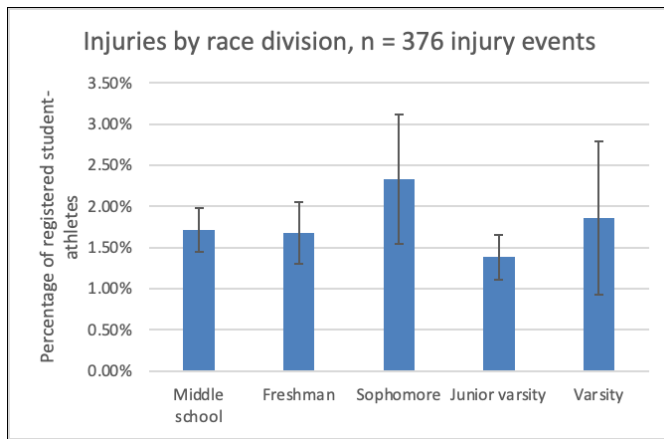


Figure A7b.

Figures A7 a and b: Student-athlete injuries during races (7a) versus practices (7b), broken out by competition division. Riders in the sophomore division appear to be at higher risk of injury during practices.

Injuries by Body Part in Races versus Practices

Races

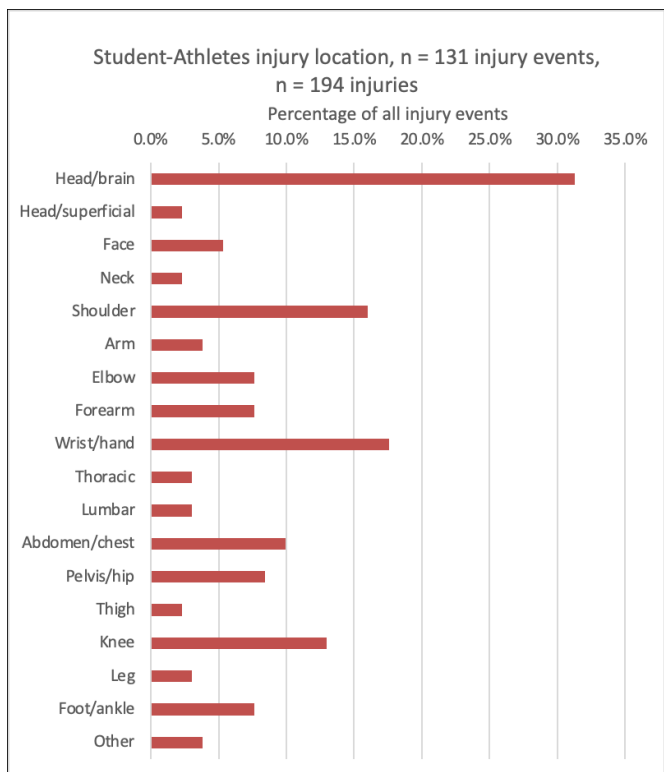


Figure A8a.

Practices

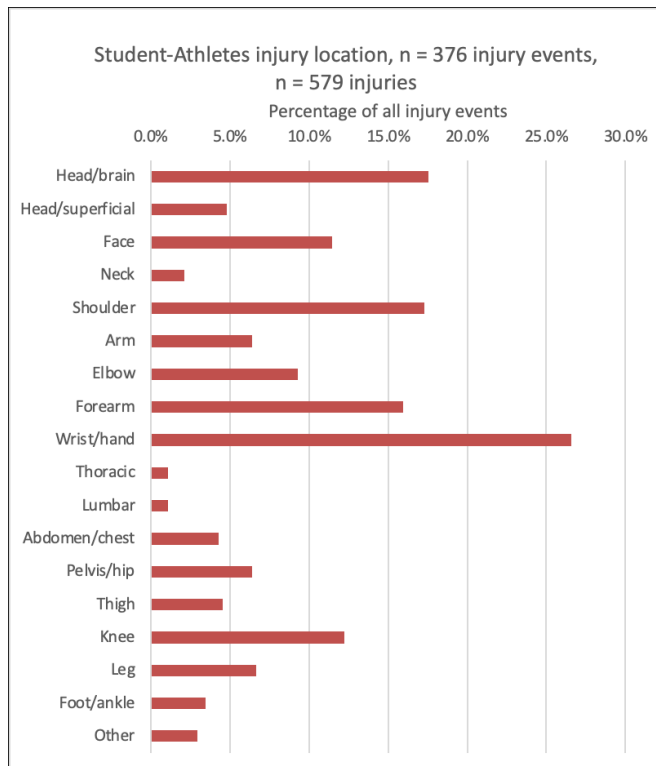


Figure A8b.

Figures A8 a and b: Anatomic location of student-athlete injuries during races (8a) versus practices (8b).

Injuries by Trail Incline in Races versus Practices

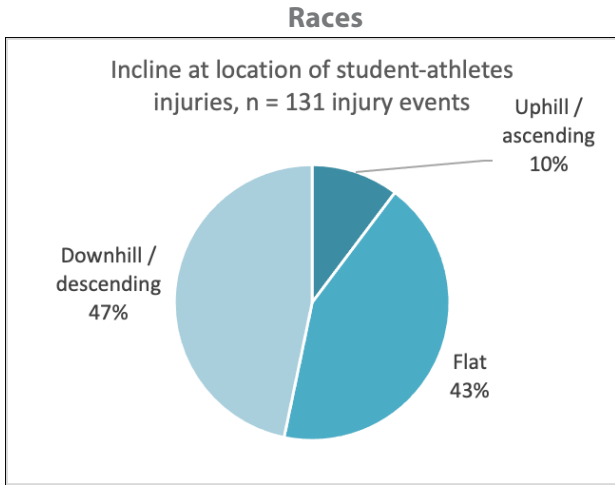


Figure A9a.

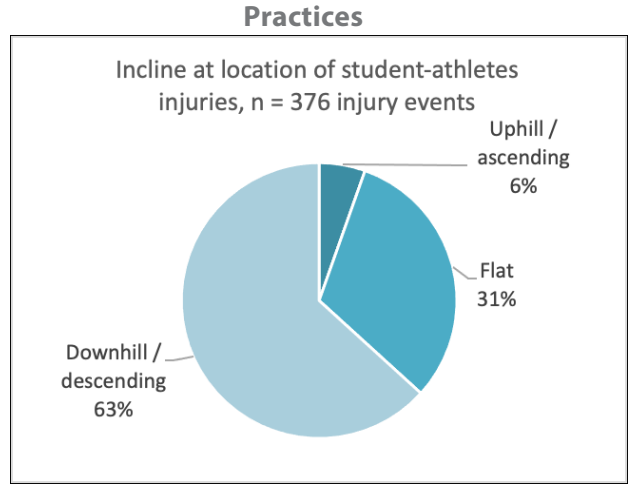


Figure A9b.

Figures A9 a and b: Percentage of injuries that occurred on flat, downhill and uphill terrain.

Student-Athlete Non-Concussion Injuries in Races versus Practices

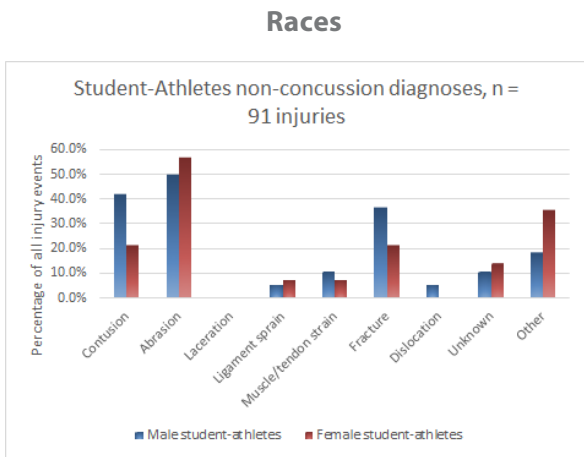


Figure A10a.

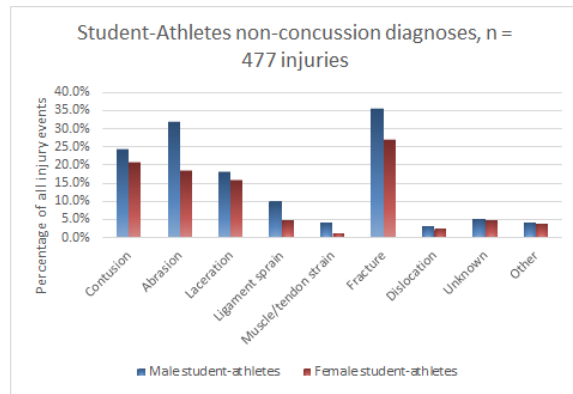


Figure A9b.

Figures A10 a and b: Percentage of non-concussion injury diagnoses in races (10a) versus practices



Figure 11. Word cloud analysis of text entry from the injury reporting form regarding how crashes occur. Control of the front tire is important for safe riding.

NICA INJURY REDUCTION STRATEGY

After the first two years of data collection, it became apparent that rider inexperience, negotiating turns, control of the front tire, and the technical nature of the trail at the crash site were associated with injury events. With this knowledge, and the hypothesis that improving rider skill level would reduce injury risk, NICA implemented its first data-driven, injury reduction strategy, consisting primarily of an enhanced, on-the-bike skills training program. This intervention started following the 2019 season. For a formal statistical analysis, the injury proportions during the 2021 year were compared with the injury proportions during the 2018 and 2019 years, combined. Data from the 2020 year were not used in the formal analysis because riding was significantly curtailed due to the coronavirus pandemic.

BEFORE VS. AFTER ENHANCED SKILLS TRAINING

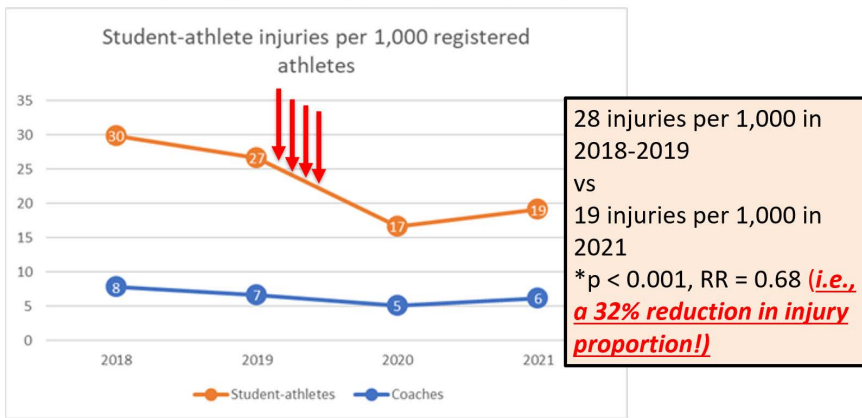


Figure 12. An analysis of nationwide injury proportion in 2021, after the NICA injury prevention intervention, resulted in nearly a one-third reduction in injuries compared with 2018 and 2019 combined. Data from the 2020 year was omitted from the formal analysis due to the coronavirus pandemic.

Injuries by Body Part: 2018-2019 vs 2021

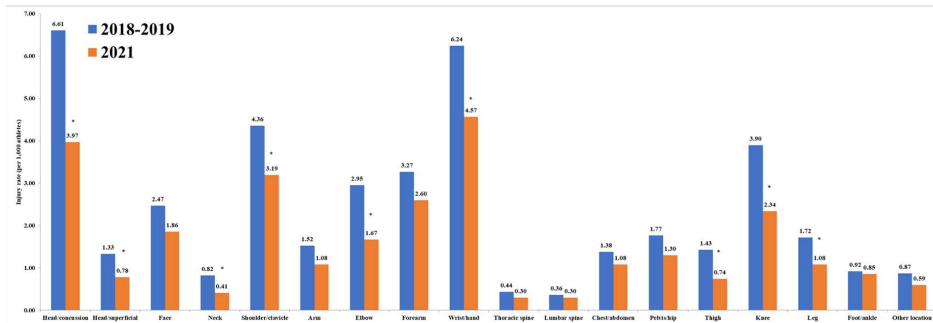


Figure 13. The reduction in injuries seen in 2021 was seen for most body parts. The asterisks indicate that the injury reduction met criteria for being statistically significant.

Non-concussion Injuries by Diagnosis: 2018-2019 vs 2021

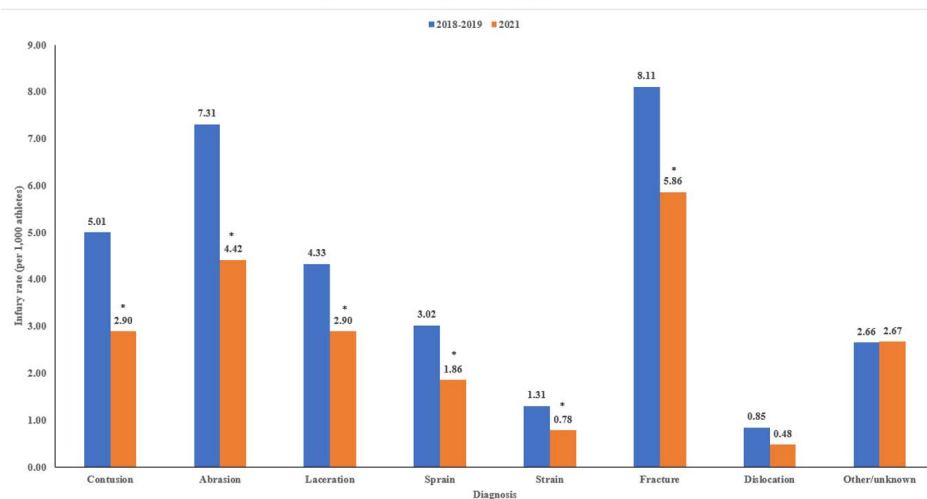


Figure 14. The reduction in injuries seen in 2021 was seen for most diagnostic categories. The asterisks indicate that the injury reduction met criteria for being statistically significant.

DATA SECTION B:

2021 COACH INJURY DATA

Introduction: To our knowledge, the NICA Safety Report is the first injury surveillance system that tracks injuries among coaches, who ride with the student-athletes during practice but not during races.

2021 Coach Summary

2021 coaches summary data	n	%
Total n of coaches Nationwide:	14,043	
Total n of male coaches Nationwide:	10,595	75%
Total n of female coaches Nationwide:	3,448	25%

Table B1. Number and percentage of NICA registered coaches, male coaches and female coaches. The percentages refer to the number of injuries per 100 coaches.

Coach Injury by Sex

Coach Injuries by sex	n	%
n and % of injured coaches Nationwide:	87	0.62%
n and % of injured male coaches Nationwide:	69	0.65%
n and % of injured female coaches Nationwide:	18	0.52%

Table B2. Number and percentage of NICA registered male and female coaches who sustained injuries during NICA-sanctioned rides. Overall, the percentage of injuries among coaches was very low. Please note that coaches do not participate in as many NICA sanctioned rides and other activities as student-athletes, and do not race in NICA-sanctioned races. Therefore, coaches' exposure to injury is less than that of student-athletes.



Coach Injuries by Body Part

Which body part(s) did the coaches injure?	All coaches		Male coaches		Female coaches	
	n	%	n	%	n	%
Head/brain	14	16.1%	7	10.1%	7	38.9%
Head/superficial	1	1.1%	1	1.4%	0	0.0%
Face	6	6.9%	4	5.8%	2	11.1%
Neck	2	2.3%	1	1.4%	1	5.6%
Shoulder	28	32.2%	24	34.8%	4	22.2%
Arm	0	0.0%	0	0.0%	0	0.0%
Elbow	1	1.1%	1	1.4%	0	0.0%
Forearm	9	10.3%	7	10.1%	2	11.1%
Wrist/hand	15	17.2%	13	18.8%	2	11.1%
Thoracic	2	2.3%	2	2.9%	0	0.0%
Lumbar	3	3.4%	2	2.9%	1	5.6%
Abdomen/chest	15	17.2%	13	18.8%	2	11.1%
Pelvis/hip	3	3.4%	2	2.9%	1	5.6%
Thigh	4	4.6%	3	4.3%	1	5.6%
Knee	7	8.0%	6	8.7%	1	5.6%
Leg	6	6.9%	5	7.2%	1	5.6%
Foot/ankle	3	3.4%	2	2.9%	1	5.6%
Other	8	9.2%	7	10.1%	1	5.6%
Total	127	146.0%	100	144.9%	27	150.0%

Table B3. Coach injuries by body part. The first category, “Head/brain,” refers to concussions. The second category, “Head/superficial” refers to other injuries to the head and face, such as abrasions (scrapes), but without a concussion. The total number of injuries (127) is greater than the total number of injury events listed in Table B2 (87) because a single injury event can result in more than one injury. For the same reason, the total percentage of injuries is greater than 100%.

Coach Injury Diagnosis, Excluding Concussions

What was the diagnosis?	All coaches		Male coaches		Female coaches	
	n	%	n	%	n	%
Contusion	10	11.5%	56	81.2%	22	122.2%
Abrasion	9	10.3%	94	136.2%	24	133.3%
Laceration	12	13.8%	60	87.0%	17	94.4%
Ligament sprain	9	10.3%	38	55.1%	12	66.7%
Muscle/tendon strain	5	5.7%	15	21.7%	6	33.3%
Fracture	34	39.1%	133	192.8%	25	138.9%
Dislocation	6	6.9%	8	11.6%	4	22.2%
Unknown	6	6.9%	31	44.9%	5	27.8%
Other	6	6.9%	25	36.2%	10	55.6%
Total # and % of injuries	97	111.5%	460	666.7%	125	694.4%

Table B4. Number and percentage of coach injuries by type of injury, excluding concussions. There was a moderate amount of relatively mild injuries such as contusion (bruise) and abrasion (scrape). However, there was a high number of more significant injuries such as dislocation (displaced joint) and ligament sprain. The total number of diagnoses (98) is greater than the total number of injury events listed in Table B2 (87) because a single injury event can result in more than one type of injury.

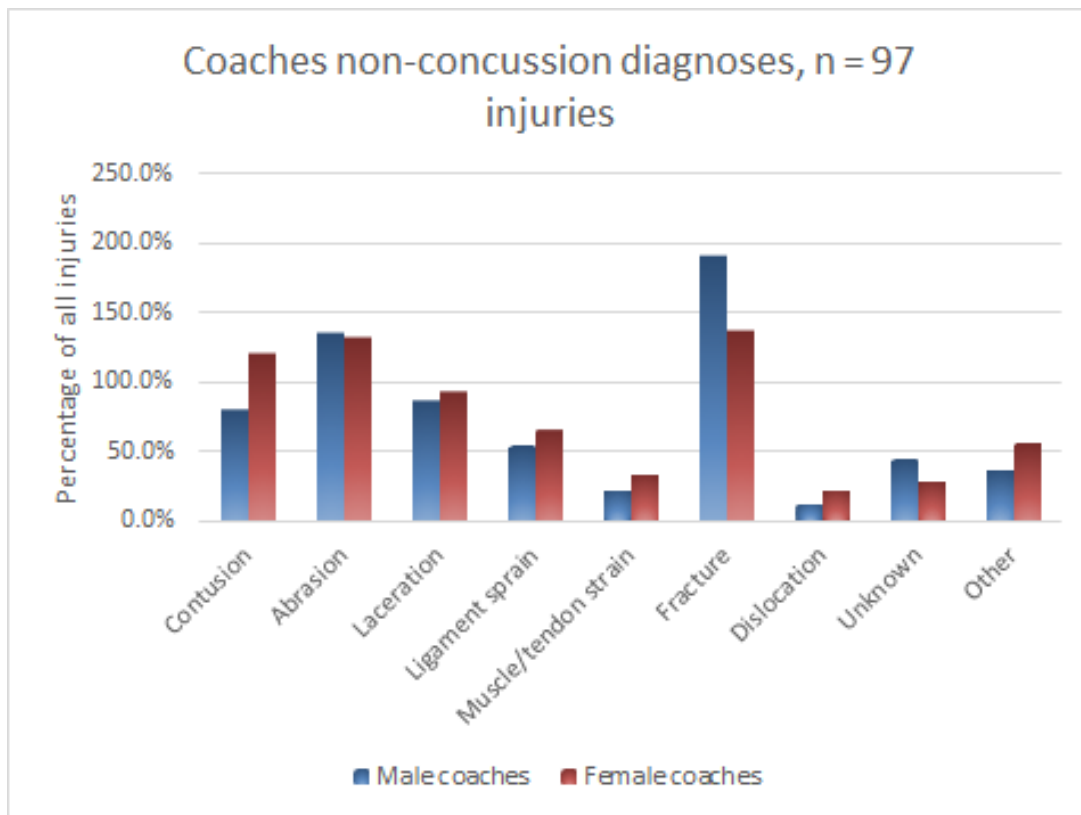


Figure B1. Non-concussion coach injuries by diagnosis.

Mode of Transportation From Injury Site

How was the coaches transported from the site where the injury occurred?	All coaches		Male coaches		Female coaches	
	n	%	n	%	n	%
Ambulance	9	10.3%	5	7.2%	4	22.2%
Helicopter	2	2.3%	2	2.9%	0	0.0%
Private vehicle	1	1.1%	1	1.4%	0	0.0%
ATV	4	4.6%	2	2.9%	2	11.1%
Other	1	1.1%	1	1.4%	0	0.0%
Total	17	19.5%	11	15.9%	6	33.3%

Table B5. Number and percentage of all coaches who required transport from the site of an injury. 19.5% of all injured coaches required assisted transportation from the injury site.

Disposition Following Injury

Disposition following injury	All coaches		Male coaches		Female coaches	
	n	%	n	%	n	%
Did not go to emergency room (ER)	32	36.8%	24	34.8%	8	44.4%
Went to ER, then sent home	45	51.7%	37	53.6%	8	44.4%
Went to ER, then admitted to hospital	9	10.3%	7	10.1%	2	11.1%
Unknown	1	1.1%	1	1.4%	0	0.0%
Total	87	100.0%	69	100.0%	18	100.0%

Table B6. Disposition of injured coaches. Over half (62.0%) of all injured coaches sought evaluation in an emergency room. 10.3% of all injuries sustained by coaches required admission to a hospital for their injury.

Trail Incline

What was the trail incline where the injury occurred?	All coaches		Male coaches		Female coaches	
	n	%	n	%	n	%
Uphill / ascending	3	4.5%	3	6.7%	0	0.0%
Flat	20	30.3%	13	28.9%	7	33.3%
Downhill / descending	39	59.1%	28	62.2%	11	52.4%
Total	62	93.9%	44	97.8%	18	85.7%

Table B7. Incline of trail at time of injury: 59.1% of coaches' injury events occurred when riding downhill. Nearly a third (30.3%) of injury events occurred on flat section of trails.

Time Off Due to Injury

Time lost from injury for coaches	All coaches	
	n	%
Less than 1 week	14	20.0%
1-2 weeks	8	11.4%
2-4 weeks	9	12.9%
At least 4 weeks	39	55.7%
Total	70	100.0%

Table B8. Time lost from injury for coaches. Time-lost data was available for 70 of 87 coach injury events. 55.7% of injuries resulted in at least 4 weeks of the bike.

Time Off Due to Injury

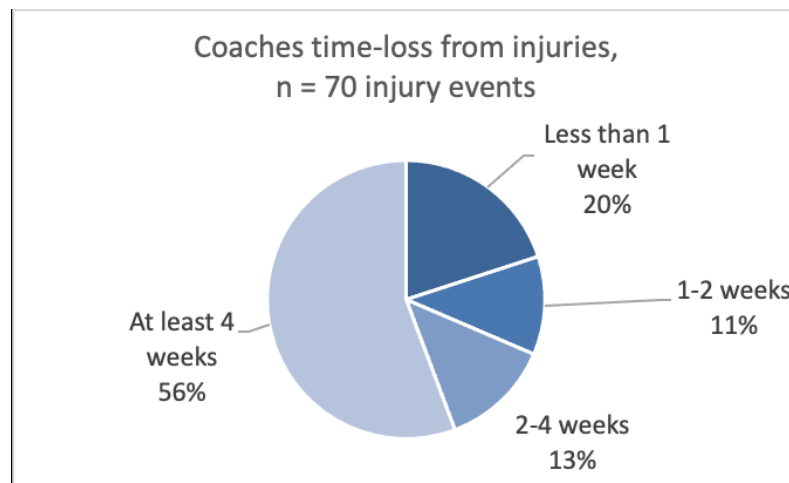


Figure B2. Pie chart representing percentages of time that coaches lost from practices and races following an injury event.

LIMITATIONS

As with all sports epidemiology endeavors, the NICA Safety Report is not without limitations. It is necessary to understand the limitations in order to appropriately interpret the data. It is also necessary to understand, accept and find ways to decrease these limitations in order to lessen the impact of the limitations on data analysis and improve the value of the data.

One primary limitation is that the information entered into the Safety Report is not usually entered by medical personnel, but rather by each team's Designated Reporter, who may or may not have medical training. The Safety Report does not collect primary source clinical documentation such as a physician's clinic notes and x-ray reports. However, the Designated Reporter who is entering the information into the injury report form is instructed to consult with the student-athlete, the student-athlete's parents/guardians, and others so that they have the best information possible about the circumstances of the injury. A key component of the Safety Report is that the electronic injury reporting form allows the Designated Reporter to return to the injury form and update it at a later time as they obtain additional information about the injury and its outcome. In the first four years of data collection (2018, 2019, 2020, and 2021), the information entered into the database regarding injuries was deemed to be of high quality, despite not having primary source medical documentation.

A second important limitation involves the challenges of obtaining exposure data. Exposure is a very important concept in sports epidemiology. A basic definition of exposure is the amount that an athlete is exposed to risk. Exposure can be estimated in different ways. In mountain biking, exposure can be a count of the number of practices and races, or the amount of time that student-athletes are on their bikes, or the distance ridden in a given period of time. For practical reasons, the simplest estimate of exposure for the purposes of the NICA Safety Report is estimated as the number of student-athletes at each NICA sanctioned practice and race. This information is supposed to be provided by a team designee such as the team director and entered into the system by the Designated Reporter. Unfortunately, during the first four years of data collection (2018, 2019, 2020, and 2021), compliance with reporting exposure information was not adequate for use in data analyses. NICA and its partners are actively working with all stakeholders to improve the capture of exposure information. Without adequate exposure data, the NICA Safety Report will remain limited in its ability to draw firm conclusions about when and why injuries are occurring, and how to decrease the risk of injury.

A third limitation involves the challenges of communicating and coordinating with hundreds of teams and thousands of student-athletes and coaches across the country. The NICA Safety Report will be most effective if all stakeholders understand the importance of contributing to the effort. NICA will continue to have regular communications with all stakeholders and will post reports such as this one on the NICA Safety Report web page.

Another limitation is that the NICA Safety Report currently focuses on acute traumatic injuries. This is because acute injuries are by far the most common type of injury sustained in mountain biking. Depending on the results of data analysis, it is possible that an additional focus on insidious onset, overuse injuries will be added in the future. It is also possible that additional questions regarding medical illness in mountain biking will also be added in the future.

As with all large injury surveillance systems, there are some incomplete fields in the database. These missing data are primarily the result of the manner in which the designated reporters complete the injury incident forms. Ongoing communications with the Designated Reporters should decrease the number of missing fields.

Finally, the NICA Safety Report is limited by time, money and brainpower. The sports medicine researchers at the University of Utah have been volunteering their time and expertise in order to find ways to make the sport safer. NICA and its collaborators continually seek research grant funding and other funding to support this important project.

SUMMARY AND FUTURE DIRECTIONS

Thanks to the hard work of many individuals, the first four years of data collection for the NICA Safety Report have been a tremendous success. The NICA Safety Report is the largest and most comprehensive mountain biking injury surveillance system in the world. It is also the first injury surveillance system to track injuries among coaches. With the knowledge gained from this report, NICA is leading the way in efforts to make the great sport of mountain biking safer, and to protect the health of the student-athletes and all others involved in this sport. Over the upcoming years, NICA and its partners will be pursuing the following steps for the NICA Safety Report:

- Continue to communicate with all stakeholders about the importance of the project and the importance of obtaining quality exposure and injury data;
- Share Safety Study data with First Aid Training Partners to improve the focus of all first aid training for NICA coaches;
- Solicit feedback from stakeholders and safety experts for more insights on how to improve the effectiveness of the project;
- Continue to post reports of findings to the NICA Safety Report web page;
- Review and improve the web-based injury reporting form;
- Carry out sub-analyses of the 2018-2021 data;
- Pursue increased compliance with reporting of exposure data;
- Pursue research grant funding and other sources of funding to support the project;
- Start planning future safety interventions;
- NICA and its partners at the University of Utah plan to conduct a large-scale, prospective, controlled safety intervention study in select leagues in the fall of 2021. More information will be provided as this exciting initiative develops.



The NICA Safety Report is the largest and most comprehensive mountain bike injury surveillance system in the world.

FUN - NICA inspires friendship, joy, and adventure.

INCLUSIVITY - NICA believes everyone should be able to participate in our programs and feel welcomed, respected, and supported.

EQUITY - NICA is committed to fair treatment, equal access, opportunity, advancement, and elimination of barriers to encourage participation for all.

RESPECT - NICA expects consideration for all others, oneself, and the outdoors.

COMMUNITY - NICA unites diverse people, families, and communities through cycling by creating fun and welcoming experiences.





Endnotes:

1. For the purposes of this report, the term “concussion” generally refers to a sports concussion, or a mild traumatic brain injury that occurs as the result of sports participation. However, there were a very small number of concussions that occurred that were more than mild. At the present time, the NICA Safety Report does not have the ability to assess the severity of these injuries. For questions regarding the use of the term concussion, please contact the NICA Director of Risk Management and Training.
2. For the purposes of this report, the term “activity” is an inclusive term that covers all NICA sanctioned activities that participants are involved with, including NICA sanctioned races, team practices on mountain biking trails, team practices on dirt or paved roads, skills training for student-athletes and coaches, and other activities during which a mountain biking injury might occur, such as Grit rides and “Adventure Days.”
3. For information on injury epidemiology in other high school sports, see: <http://www.ucdenver.edu/academics/colleges/PublicHealth/research/ResearchProjects/piper/projects/RIO/Documents>



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TREK

