

Identifying Competition Safety Focal Points

An Analysis of Medical Withdrawal Rates
in Direct Elimination Bouts
(2019–2020 through 2024–2025 Seasons)



USA
FENCING

Table of Contents

Terms of Use.....	2
Introduction	3
Methodology Notes	4
Background.....	6
Summary of Findings.....	8
Medical Withdrawal Propensities.....	10
By Weapon Type.....	10
By Event Type.....	13
By Age and Gender.....	15
By Rating.....	17
By Competitive Tenure	18
Conclusions	21
Appendix	22
By Age and Gender.....	22
By Rating.....	23
By Competitive Tenure	24

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Introduction

The sport of Olympic fencing has historically been considered the safest combat sport for its participants.¹ Fencing is a life sport that enables participants of all ages, genders, and skill levels to train and compete together in relative safety. While many injury studies have been conducted to identify injury rates, factors, and propensities, no large scale injury analysis has been possible because fencing injury data is not collected at scale or in a manner necessary to produce meaningful injury-specific insights or statistics. The only data that exists at-scale are medical withdrawal data from direct elimination bouts, but this is not injury specific.

This report was developed to provide USA Fencing and its members with insights into direct elimination medical withdrawal propensities based on Fencing Time Live data collected between August 3rd, 2019 and July 28th, 2025, covering 26,930 events and 44,527 unique fencers in the United States. The results of this analysis have identified trends and competitor segments which were more likely to medical withdrawal. It is our hope that these insights help USA Fencing better understand medical withdrawal behaviors, and develop strategies and tactics that reduce medical withdrawals for higher risk competitor segments, to maintain the sport's overall low medical withdrawal rate as part of its existing safety efforts.

It is important to note that the medical withdrawal designator in the data available for this analysis does not identify the reason for the medical withdrawal. A medical withdrawal covers a wide range of medical reasons including illness, disease, pre-existing conditions, disorders, temporary non-injury medical issues such as exhaustion, dehydration, muscle cramps, and both time-loss and non-time-loss injuries. Additionally, for actual injuries we cannot know if an injury occurred during a DE bout, developed in a prior DE or pool bout, developed during training, if it was a lingering injury, or the severity or nature of the injury. There are also incentives for a fencer to *not* medically withdrawal at the time of an injury or other qualifying medical reason. For example, if a fencer has a lead and/or is near 15 touches (or 10 for Vets, Y8, and Y10 events), they may attempt to finish the DE bout if winning will gain them points or earn them a higher rating, and then medical withdrawal in the subsequent DE bout.² Therefore, medical withdrawal rates should not be viewed as a good proxy for injury rates or fully reliable relative to a particular competitor segment.

The results of this analysis demonstrate the very low medical withdrawal rates across all age groups, genders, experience levels, and ratings levels, while identifying focal points for efforts to monitor and improve safety. We hope you find this analysis insightful.

Marc Shull
Chairman, Data Resource Team

¹ NGB Medical Standards – Sport Risk Level: [click here](#)

² Per the 2025–2026 Athlete Handbook, “if medical withdrawal occurs during pool round (fencer does not complete pool), then fencer has no results to report and cannot be used towards competitive field total to determine rating or qualification to championships. If medical withdrawal occurs after completion of the pool or during DE period – fencer keeps place in table to determine results AND may be used towards competitive field total to determine rating AND/OR qualification to championships.”

Methodology Notes

The Data

This analysis was based on 638,132 direct elimination bouts recorded in Fencing Time Live between August 3rd, 2019, and July 28th, 2025, along with member data from the USA Fencing database. Fencing Time Live has been capturing an increasingly large share of tournament events in the United States since its inception in 2018, but it does not capture 100% of DE bouts data in the United States, especially at the local level and for unsanctioned events.

This analysis is based on direct elimination bouts and does not include pool data. As the data are currently recorded in Fencing Time Live, it is only possible to assess direct elimination (“DE”) bouts as this is the only bout type where the data identifies the specific bout and opponent where a fencer medically withdraws. A medical withdrawal during pools results in all completed pool data associated with that fencer being erased and does not indicate if a fencer medically withdrew before the start of pool bouts or during the pool bouts, and could therefore be due to a non-fencing related issue.

A limited amount of data was appended to the Fencing Time Live data from the USA Fencing member database. The appended information included the first date upon which each member had a membership type that permitted competition and their birth date. These two data points were used to calculate the number of days of “competitive tenure” and the ages for each participant on the date of each DE bout.

Of the 638,132 direct elimination bouts available in the data, 637,283 from 44,527 fencers across 26,930 events were used in this analysis. 849 DE bouts (0.13% of all DE bouts) were not included in the analysis because they were missing one or more key assessment data points such as a USA Fencing Member ID, gender, or age for either the fencer or the opponent. From the remaining 637,283 direct elimination bouts there were 2,155 medical withdrawals. For the competitive tenure portion of the analysis, an additional criterion was included, a non-negative value for competitive tenure. For that portion of the analysis, the DE bout counts were 631,677 and the medical withdrawal counts were 2,132, which produced a slightly lower overall medical withdrawal rate of 0.3375% versus 0.3382%.

Key Considerations

Some USA Fencing members over the course of their competitive careers have had multiple member ID numbers. This analysis did not consolidate DE bouts associated with different members IDs to the unique individual so they appear as separate fencers in the data and this analysis. Additionally, in some cases fencers who competed in DE bouts in more than one weapon were also not consolidated to properly account for them at the weapon level.

At the local and regional level it is not uncommon for a fencer to compete in multiple events in the same day, some of which may partially overlap. In such cases, due to the way the data are recorded, it is not possible to determine if a fencer’s medical withdrawal was partially or wholly due to a medical issue in a preceding or overlapping event.

Gender terminology was chosen to distinguish between events and actual participants. All events are defined a Men's, Women's or Mixed as they are in Fencing Time Live. DE bout terminology is based on the actual participants within individual DE bouts and are defined as female versus female, male versus male, and female versus male (mixed).

Metrics

To create metrics from mixed gender DE bouts that were comparable to single-gender DE bouts, we created "effective rates". For example, if a Men's event had a medical withdrawal rate of 0.2681% that would include medical withdrawals from both male competitors. However, for mixed gender DE bout we needed to measure each gender participant separately and account for underrepresentation of medical withdrawal rates, as there could only be one competitor per gender from each mixed gender DE bout. To account for this, we created "effective rates" that estimated what the overall rate would be if the male or female fencer withdrew at the same rates against members of the same gender based on which fencer medically withdrew from each individual DE bout. To accomplish this we doubled the medical withdrawal rate for each gender sub-segment from mixed gender DE bouts.

To calculate the perspective of one medical withdrawal per the number of DE bouts, simply divide 1 by the raw number. For example, the overall mean medical withdrawal rate was 0.3382% so $1 / 0.003382 = 295.68$, meaning there was 1 medical withdrawal per 296 (rounded) DE bouts.

Null Hypothesis Testing

The null hypotheses³ for this analysis are:

1. H_0 : All sub-segments have a medical withdrawal rate = 0.003382. i.e. All sub-segments have the same medical withdrawal rate as the overall mean medical withdrawal rate.
2. H_0 : There is no statistical difference between any sub-segment and the related segment total mean medical withdrawal rate.

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

\bar{p} = pooled variance

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

All references in this analysis to statistical significance are based on a 95% confidence level.

To determine statistical significance, we used a two-proportion z-test, a standard statistical method that compares two percentages.

³ A null hypothesis is a statement in statistics that asserts there is no significant statistical difference or relationship between specified populations or variables. It serves as a baseline assumption that this research aimed to test against through statistical analysis. Where the difference or relationship disproved the null hypothesis based on our applied 95% confidence level, then the difference is determined to be statistically significant.

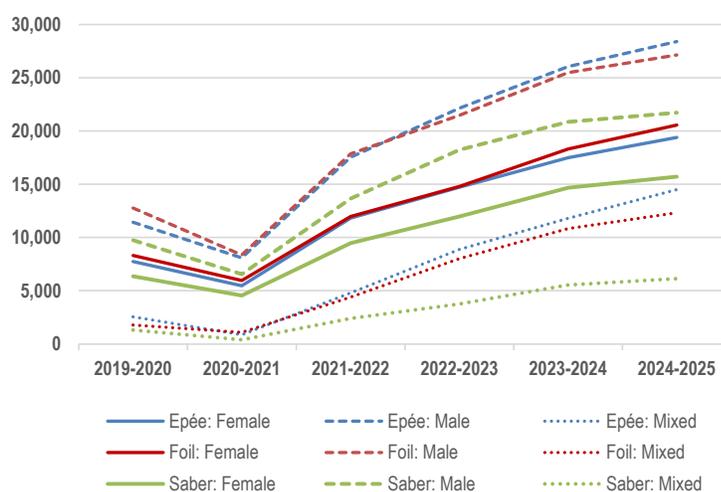
Background

It is important to note that the 2019–2020 and 2020–2021 seasons were severely impacted by Covid-19. While we do not have reason to believe events prior to the Covid-19 global shutdown were meaningfully impacted, total counts from these seasons were noticeably lower due to event cancellations, travel restrictions, and other factors. Means (e.g. averages), such as medical withdrawal rates should have seen a limited impact during the 2019–2020 season, but the masking, temperature, and other guidelines put in place during the 2020–2021 and 2021–2022 seasons were likely to have impacted metrics like medical withdrawal rates during those seasons. The considerably reduced number of events may have played a role as 2020–2021 had the fewest events and the lowest medical withdrawal rates, including zero medical withdrawals across all Mixed event DE bouts that season.

In the three seasons since the 2021–2022 season, the number of events increased by 63.8% while the number of DE bouts grew by 76.6%. This growth was even higher compared to earlier seasons, however, these seasons were impacted by Covid-19 and early growth of Fencing Time Live.

Since the 2020–2021 season, all weapons and gender event types have seen substantial increases in the number of events and DE bouts, with total Mixed events seeing the most growth by far at 168.9% and the number of mixed DE bouts growing 193.3%. This growth of Mixed events far outstripped the growth of Women’s (33.8%) and Men’s (31.4%) events over the same time frame.

Total DE Bouts per Season by Weapon & Gender



Mixed events are growing rapidly, but still represent a small share of DE bouts. During the 2024–2025 season, 37.6% of events were Mixed, 31.3% were Men’s events, and 31.1% were Women’s events. However, it is important to keep scale in mind as Mixed events in the 2024–2025 season only represented 19.9% of all DE bouts while Men’s and Women’s events accounted for 46.6% and 33.6% of DE bouts respectively. Mixed events were most prevalent in the least populated U.S. states. Of the ten least populated U.S. states that had at least one event entered in Fencing Time Live in the 2024–2025 season, Mixed events represented 61% or more of the events in eight of those states.⁴ Ten states hosted no events in the 2024–2025 season and another five states only hosted Mixed events.

⁴ VT, ME, NH, ID, NE, KS, IA, NV, UT, and CT where the 10 lowest population states to host an event in the 2024–2025 season that was recorded in Fencing Time Live. Among the actual lowest population states: WY, VT, AK, ND, SD, DE, RI, MT, NE, and NH, only VT, ME, and NH hosted events. NV hosted no Mixed events (Men’s and Women’s only) and 29.9% of events in CT were Mixed. HI, ID, KS, ND, and OK only hosted Mixed events. AK, AR, DE, MS, MT, NM, RI, SD, WV, and WY hosted no events recorded in Fencing Time Live.

This table lists the number of events for each weapon type and gender combination by season.

Events by Weapon & Gender by Season

Weapon & Gender	Count of Events						YoY Growth		
	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2022-2023	2023-2024	2024-2025
Epée: Women's	349	248	560	598	734	756	6.8%	22.7%	3.0%
Epée: Men's	351	258	562	615	729	745	9.4%	18.5%	2.2%
Epée: Mixed	154	79	335	587	834	1,025	75.2%	42.1%	22.9%
Foil: Women's	344	242	541	613	720	745	13.3%	17.5%	3.5%
Foil: Men's	350	250	559	611	705	726	9.3%	15.4%	3.0%
Foil: Mixed	145	108	376	638	823	957	69.7%	29.0%	16.3%
Saber: Women's	318	230	510	562	640	654	10.2%	13.9%	2.2%
Saber: Men's	335	245	530	598	662	699	12.8%	10.7%	5.6%
Saber: Mixed	130	57	258	362	544	624	40.3%	50.3%	14.7%
Total	2,476	1,717	4,231	5,184	6,391	6,931	22.5%	23.3%	8.4%

This table lists the number of DE bouts for each weapon type and gender combination by season.

DE Bouts by Weapon & Gender by Season

Weapon & Gender	Count of DE Bouts						YoY Growth		
	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2022-2023	2023-2024	2024-2025
Epée: Female	7,749	5,463	11,823	14,728	17,488	19,406	24.6%	18.7%	11.0%
Epée: Male	11,440	8,086	17,536	22,132	26,042	28,395	26.2%	17.7%	9.0%
Epée: Mixed	2,555	865	4,800	8,871	11,801	14,490	84.8%	33.0%	22.8%
Foil: Female	8,317	5,962	11,973	14,790	18,302	20,546	23.5%	23.7%	12.3%
Foil: Male	12,755	8,374	17,867	21,484	25,483	27,134	20.2%	18.6%	6.5%
Foil: Mixed	1,773	1,079	4,409	8,011	10,826	12,317	81.7%	35.1%	13.8%
Saber: Female	6,371	4,545	9,476	11,970	14,672	15,717	26.3%	22.6%	7.1%
Saber: Male	9,756	6,559	13,648	18,226	20,849	21,717	33.5%	14.4%	4.2%
Saber: Mixed	1,305	394	2,395	3,775	5,550	6,135	57.6%	47.0%	10.5%
Total	62,021	41,327	93,927	123,987	151,013	165,857	32.0%	21.8%	9.8%

Since the 2020–2021 season, the number of fencers actively competing rose annually by double–digits percentages until the 2024–2025 season when it grew 7.7% year–over–year (“YoY”). Over the past three seasons, the number of active foil competitors increased by a total of 62.3%, followed by épée at 60.6% and saber at 52.4%.

Active Competitive Members by Weapon & Season

	Count of Active Competitive Members						YoY Growth		
	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2022-2023	2023-2024	2024-2025
Epée	7,168	4,492	9,403	11,576	13,890	15,097	23.1%	20.0%	8.7%
Foil	6,545	4,240	8,513	10,595	12,798	13,815	24.5%	20.8%	7.9%
Saber	5,156	3,494	6,362	8,029	9,161	9,697	26.2%	14.1%	5.9%
Total	18,869	12,226	24,278	30,200	35,849	38,609	24.4%	18.7%	7.7%

Note: Table figures of active members counts each member once per weapon fenced in a competition. Therefore, the total number of competitive members is higher than the actual number of members.

The steady and substantial growth in the number of active competitors, number of events, and DE bouts provides a contextually relevant foundation for understanding the medical withdrawal trends identified in this analysis.

Summary of Findings

Medical withdrawals from direct elimination fencing bouts were relatively rare over the past six seasons. During this analysis period, there was, on average, 1 medical withdrawal for every 296 direct elimination (“DE”) bouts. This equates to 0.338%, based on 2,155 medical withdrawals out of the 637,283 DE bouts analyzed. 3.9% of the 44,527 unique competitive USA Fencing Members with DE bout data had one or more medical withdrawals over the last six seasons, with 83.3% of those who had medically withdrawn, having done so only once. Given the mean competitive tenure is 3.7 years⁵, most fencers will not medically withdraw from a DE bout during their competitive career. Despite the low prevalence of medical withdrawals from DE bouts, this analysis identified factors that were more likely to be associated with this outcome.

When comparing medical withdrawal rates by weapon type, event type, gender, age, rating, and competitive tenure, we identified statistically significant differences between some sub-segments of the data views but overall, medical withdrawal rates were low. There were four instances where a sub-segment had a statistically significant medical withdrawal rate over 1% at the 95% confidence level⁶ compared to the overall rate or total segment rate. The other instances of medical withdrawal rates over 1% were not statistically significant due to there being a very small number of DE bouts between the comparative groups (“sub-segments”). For example, over the past six years, the medical withdrawal rate between A-rated female fencers and D-rated male fencers was 1.515%, about 4.5x higher than the mean (0.338%). However, as there has only been 1 medical withdrawal out of 66 DE bouts, the 1.515% figure does not have a large enough sample size (i.e. number of DE bouts) to be statistically different from the mean (0.338%). In other words, despite this higher medical withdrawal rate, it would be premature and potentially incorrect to conclude that this elevated medical withdrawal rate would remain at the same level if there were more DE bouts between these two fencer sub-segments, or that the male fencer who medically withdrew in this example was at an unfair disadvantage for medical withdrawals.

This analysis considered medical withdrawals from multiple data views, with each data view offering useful insights and trends, but individually none of them provided a decisive understanding of what drives higher medical withdrawal rates. Looking at the data holistically, there were multiple inter-related factors that contribute to the likelihood that a fencer will medically withdraw from a DE bout. Looking across the different data views, we saw that as fencers competed in more and increasingly competitive events, against more experienced competitors, and attained higher ratings, the likelihood of a fencer medically withdrawing increased. In many cases, the timing appeared to coincide with high school age fencers hoping to earn a college scholarship. Unfortunately, these factors cannot be analyzed in conjunction with training frequency and intensity, contributing health considerations, or any other factor that could be contributing to the medical withdrawal rates.

⁵ Based on Competitive Tenure for fencers active in the 2024–2025 season this was 3.7 years, up from a low of 2.7 years in the 2019–2020 season.

⁶ In laymen’s terms, the 95% confidence level means that we are confident that the true rate of the sub-segment is actually different from the overall mean DE bout medical withdrawal rate because the combination of the medical withdrawal rates being different enough and there being enough DE bouts in the sub-segment produced a statistical output that estimated that we would expect similar results 95% of the time.

Key findings based on the six year analysis period:

- 3.9% of fencers had one or more medical withdrawals. 291 fencers, 0.65% of unique fencers⁷ in this analysis, have medically withdrawn more than once.
- Overall, medical withdrawal rates have varied over the past six seasons with a high of 0.367% in 2023–2024 and a low of 0.234% in 2020–2021.⁸
- There was a weak, but statistically significant relationship between the number of DE bouts and the likelihood to have a medical withdrawal in a given season (correlation 0.15; $p < 0.0001$). This relationship increased as fencers achieved higher ratings peaking with A–rated fencers (0.19; $p < 0.0001$).
- **By Weapon:** Foil DE bouts had the *highest* medical withdrawal rate of all weapons at 0.393% and épée the lowest at 0.261% (the saber mean was 0.369%).
- **By Gender:** Mixed gender DE bouts had the *highest* overall medical withdrawal rate of all gender bout types at 0.434% and Women’s events had the *lowest* at 0.331% (the Men’s events mean was 0.334%), however this was not true across all weapons. The hypothesis that female fencers were more likely to medical withdrawal versus male fencers was not consistently supported as there were numerous and significant examples⁹ where the female competitor in a mixed DE bout was *less* likely than the male competitor to medical withdrawal.
- **By Age:** DE bouts between fencers age 10 and under had the *lowest* medical withdrawal rate at 0.169%, while DE bouts between fencers age 30+ and fencers age 13 to 14 had the *highest* medical withdrawal rate at 0.503%. 65.7% of those medical withdrawals were by the fencer age 30+.
- **By Rating:** DE bouts with at least one A–rated fencer were the *most* likely to have a medical withdrawal at 0.431%, and DE bouts with at *least* one Unrated fencer were the *least* likely to have a medical withdrawal at 0.284%.
- **By Event Type:** Medical withdrawal rates increased in a steady manner by age for youth events, from Y8 (lowest at 0.102%) to Junior (0.388%). Open (0.464%) and Div1A (0.455%) event types had the *highest* overall medical withdrawal rates of all event types, and Vet70 the overall *lowest* at 0.072%.
- **By Competitive Tenure:** Medical withdrawal rates increased over the first seven year of competitive tenure, peaking at 0.466%, then noticeably dropping off.

⁷ Unique fencers per weapon. Fencers competing in multiple weapons were counted once per weapon.

⁸ Lower medical withdrawal rates in the 2019–2020 and 2020–2021 have the added consideration of fewer events which may have reduced season long wear on the athlete.

⁹ See the foil portion of the By Weapon section of this report on page 10 for more details.

Medical Withdrawal Propensities

For the purposes of this analysis, all references to “medical withdrawals” and “MW” refer exclusively to direct elimination bouts and all metrics are based on the six season analysis period as outlined in the Methodology section of this report except where otherwise identified.

By Weapon Type

Comparison of medical withdrawal rates across the three weapon types demonstrated meaningful variation, not only by weapon but across seasons and genders. The role gender played in medical withdrawals was inconsistent, and variation may have been in part due to the noticeably smaller, but rapidly growing, number of Mixed events, with the number of Mixed events growing by 168.9% since 2021–2022 compared to 63.8% overall growth in the number of events. Over the six seasons analyzed, foil and saber traded the top spot for the highest medical withdrawal rate while épée maintained a consistently and statistically significant lower rate of medical withdrawals.

Compared to épée with a medical withdrawal rate of 0.261%, foil had a 50.3% **higher** medical withdrawal rate (0.393%) and saber had a 41.0% **higher** rate (0.369%). Foil had a 6.6% **higher** medical withdrawal rate than saber, making DE foil bouts the mostly likely to result in a medical withdrawal. Within épée and saber, the higher medical withdrawal rates in mixed gender DE bouts were statistically significant relative to the overall weapon-specific mean (see table to the right).

The seasons heavily impacted by Covid-19, 2019–2020 to 2021–2022, had the lowest rate of medical withdrawals over the past six years. Over the past three years, the mean medical withdrawal rate has stabilized near 0.363%, which equates to 1 in every 276 DE bouts.

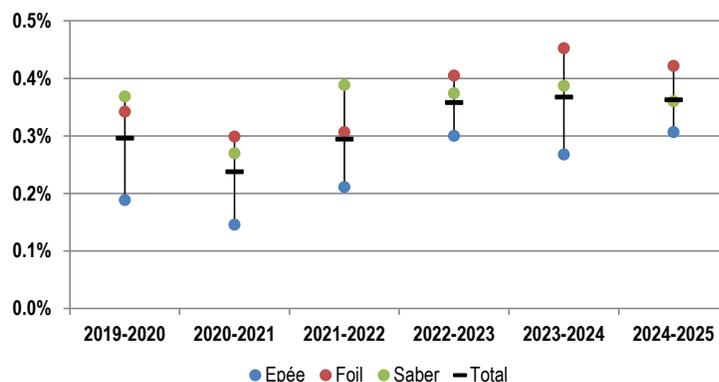
At the weapon level, épée, foil, and saber showed noticeably different, and somewhat inconsistent, trends across seasons and gender DE bout types indicating that gender does not play a decisive or consistent role in medical withdrawal rates. For example, mixed gender DE bouts mostly had **higher** medical withdrawal rates in épée and saber, while mixed gender DE foil bouts were **always lower** than female vs. female DE bouts, and lower than male vs. male DE foil bouts in all but one season.

Average Medical Withdrawal Rates

	Epée	Foil	Saber	Total
Female vs. Female	0.226%	0.416%	0.349%	0.331%
Male vs. Male	0.268%	0.383%	0.363%	0.334%
Mixed Gender	0.411%*	0.353%	0.648%*	0.434%*
Total	0.261%†	0.393%†	0.369%†	0.338%

Note: * indicates statistical significance compared to the column total at the 95% confidence level.
 † indicates statistical significance compared to the overall total at the 95% confidence level.

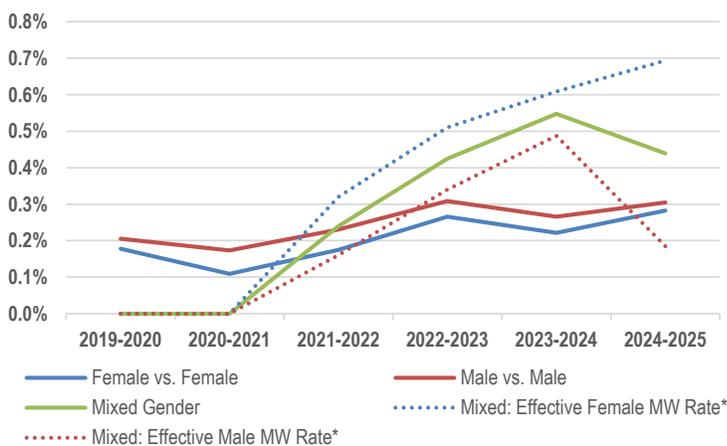
DE Medical Withdrawal Rates by Weapon & Season



Epée

Epée consistently had the **lowest** medical withdrawal rate (0.261% or 1 in 383 DE bouts) of the three weapons in each of the six seasons analyzed, often by substantial margins. There were zero medical withdrawals from Mixed épée events recorded in the 2019–2020 and 2020–2021 seasons. Out of all weapon–gender–event type combinations, Women’s épée events were the **least** likely to have a medical withdrawal (0.226%; 1 in 442 DE bouts) and Men’s épée events were the next least likely to have a medical withdrawal (0.268%; 1 in 373 DE bouts). Mixed épée events were **higher** at 0.411% (1 in 243 DE bouts), but slightly **lower** than Women’s foil events. Overall, 66.0% of medical withdrawals in mixed gender épée DE bouts were by the female competitor.

DE Medical Withdrawal Rate by Season: Epée

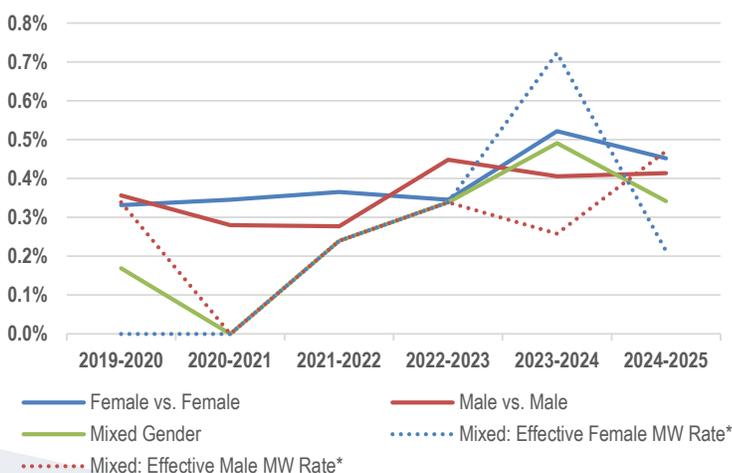


Over the past four seasons, épée (along with saber) had consistently **higher** medical withdrawal effective rates (i.e. the dotted lines in the chart above) for the female competitor in mixed DE bouts compared to their male counterpart and to female versus female DE bouts. Interestingly, the effective medical withdrawal rate for male competitors in mixed gender DE bouts was also higher than the rate in male versus male DE bouts in two of the last three years indicating some factor other than gender appeared to be influencing the higher mixed DE bout medical withdrawal rates. The continued rise of the effective medical withdrawal rate for female fencers in mixed DE bouts is an area for additional research as it had one of the steadiest trends in this analysis, even as the medical withdrawal rate for the male counterpart declined substantially in the 2024–2025 season.

Foil

Foil had the **highest** rate of medical withdrawals (0.393% or 1 in 255 DE bouts) of all three weapons, and uniquely, female versus female DE bouts had an overall **higher** medical withdrawal rate than both male versus male and mixed DE bouts. Foil’s higher DE bout medical withdrawal rate was in part driven by higher female versus female withdrawal rates over the past two seasons (compared to the 2022–2023 season). During the past two seasons, male versus male medical withdrawal rates decreased relative to the 2022–2023 season. Mixed gender DE bouts showed inconsistent

DE Medical Withdrawal Rate by Season: Foil



results declining in 2024–2025 to a medical withdrawal rate 24.4% *lower* than female versus female DE bouts and 17.3% lower than male versus male DE bouts. Unlike épée and saber, foil medical withdrawal rates for mixed gender DE bouts have *never* exceeded female versus female DE bouts. This indicates that some aspects of foil’s rules, or another factor, may be negating the effects of competitors of different genders on medical withdrawal rates seen in épée and saber.

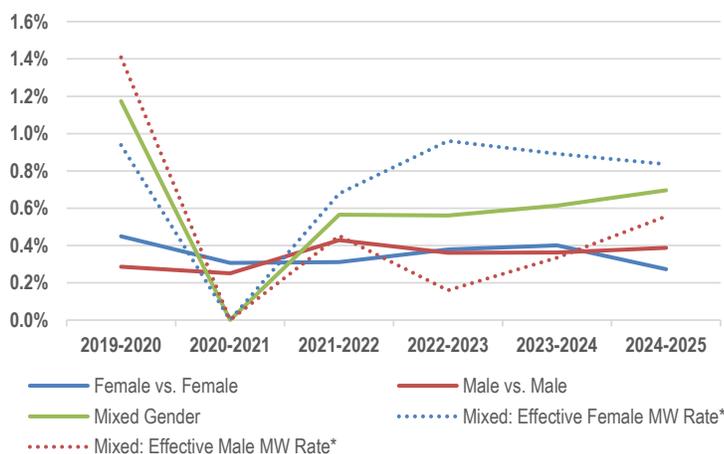
Foil best demonstrated the inconsistent nature of gender-based medical withdrawal behaviors. Males had a *higher* medical withdrawal rate in two of the six seasons as shown in the chart above, and 52.0% of medical withdrawals in mixed gender foil DE bouts were by the female competitor. This near parity medical withdrawal ratio stands in contrast to épée and saber and indicates, at least for foil, that gender does not appear to be a meaningful medical withdrawal factor in mixed gender DE bouts.

Saber

Despite the explosive and slashing nature of saber, this weapon had a lower medical withdrawal rate (0.369% or 1 in 271 DE bouts) than foil (0.393%). Other than in 2020–2021, when there were zero medical withdrawals from Mixed saber events recorded, mixed gender saber DE bouts have had consistently *higher* medical withdrawal rates than female versus female and male versus male DE bouts. Although mixed gender DE bouts only represented 5.0% of saber DE bouts, they were 75.2% more likely to have a medical withdrawal than the overall saber mean, with 65.1% of those medical withdrawals being by the female competitor.

Over the past four seasons, saber medical withdrawal rates for female versus female, male versus male, and mixed gender DE bouts have been relatively stable compared to épée and foil. However, the medical withdrawal rate for saber in the 2019–2020 season was exceptionally high at 1.17% (1 in 85 DE bouts) and it was the only season in which the male competitor was more likely to be the medically withdrawing fencer. Despite the small number of recorded mixed saber DE bouts in the 2019–2020 season (426 DE bouts with 5 medical withdrawals) this rate was statistically significant at the 95% confidence level when compared to the overall medical withdrawal rate for saber that season.

DE Medical Withdrawal Rate by Season: Saber



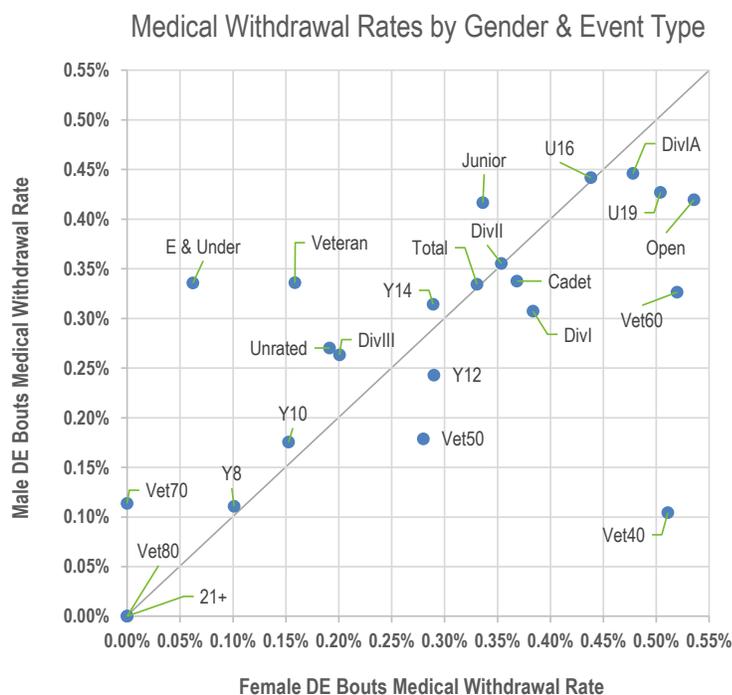
By Event Type

Evaluation of medical withdrawal behaviors by event type showed there were distinctive patterns tied to age-based and most ratings-based events. With the exception of Division I, medical withdrawal rates increased from Division III through Division IA, and consistently from Y8 through Juniors and U19. These patterns were present for Women's, Men's, and Mixed gender event types. Veteran's events generally had lower medical withdrawal rates although there was some variation that was partially driven by higher female vs. female medical withdrawal rates in Vet40 and Vet60. Overall, these findings align with those from the age group analysis in the next section in this report.

The youngest and oldest age-based events had the lowest medical withdrawal rates of any event type, with Vet70 at 0.072% (1 in 1,398 DE bouts) and Y8 at 0.102% (1 in 978 DE bouts). Conversely, Open events at 0.464% (1 in 216 DE bouts) and U19 at 0.467% (1 in 214 DE bouts) had the highest medical withdrawal rates which were 37.2% and 38.1% higher than the overall medical withdrawal rate mean of 0.338% (1 in 296 DE bouts).

Although many event types produced similar results for female and male competitors, there were some event types where one gender DE bout type produced noticeably different results. For example, the E & Under and Vet40 events showed very different medical withdrawal rates by gender (see the *Medical Withdrawal Rates by Gender & Event Type* chart to the right), however, due to the relatively small number of DE bouts neither of these were statistically significant at the 95% confidence level relative to their overall mean or when comparing medical withdrawal rates of the two genders.

Overall, 60.8% of medical withdrawals in mixed gender DE bouts were by the female competitor. However, it should be noted that most mixed gender DE bout sub-segments in the table below did not have enough occurrences to produce statistically reliable metrics at the event type level (ex. Junior, Cadet, Div I, etc.). Of the 22 event types for mixed DE bouts, 14 did not have a mean medical withdrawal rate that was statistically different from the overall rate, and another 3 had zero DE bouts. The remaining 5 event type mixed sub-segments had medical withdrawal rates that were statistically different from the overall rate, but were based on a small number of DE bouts in some cases (i.e. U16 with 38 DE bouts and U19 with 75 DE bouts). Therefore, the % of medical withdrawals that were by the female competitor in mixed



gender DE bouts should be viewed in the contexts of the number of DE bouts in that sub-segment¹⁰ and relative to female versus female and male versus male medical withdrawal rates. For example, these figure show that mixed gender Y12 DE bouts do not have a statistically different medical withdrawal rate compared to female vs. female DE bouts (0.284% vs. 0.290% respectively), and the share of medical withdrawals in Y12 mixed gender DE bouts was nearly evenly split as the Y12 female competitor was slightly *less* likely to be the one who medically withdrew (47.1%).

Medical Withdrawal Rate by Event Type & DE Bout Gender Type

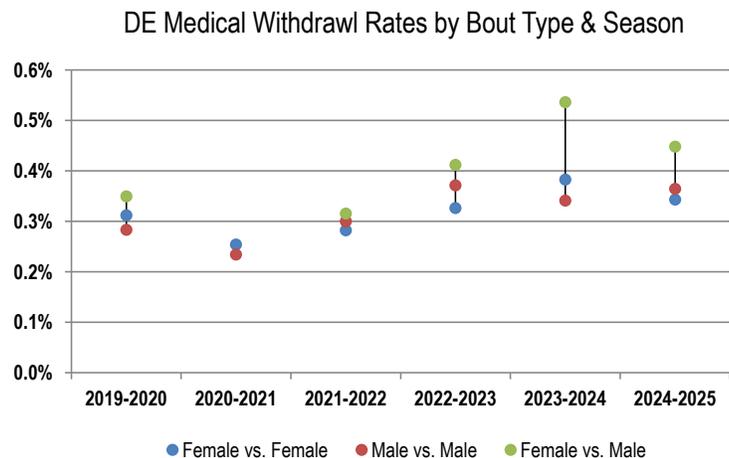
Event Type	Total				DE Bouts by Bout Gender Type			MWs by Bout Gender Type			DE Bout MW Rate			MW Share	
	DE Bouts	# of MWs	MW Rate	Index	Female	Male	Mixed	Female	Male	Mixed	Female	Male	Mixed	% Female	% Male
Y8	6,849	7	0.102%*	30	1,980	3,612	1,257	2	4	1	0.101%	0.111%*	0.080%	0.0%	100.0%
Y10	51,491	86	0.167%*	49	19,021	28,498	3,972	29	50	7	0.152%*	0.175%*	0.176%	71.4%	28.6%
Y12	87,674	231	0.263%*	78	33,113	48,581	5,980	96	118	17	0.290%	0.243%*	0.284%	47.1%	52.9%
Y14	105,363	330	0.313%	93	41,146	60,465	3,752	119	190	21	0.289%	0.314%	0.560%*†	52.4%	47.6%
Cadet	67,307	236	0.351%	104	27,418	39,677	212	101	134	1	0.368%	0.338%	0.472%	100.0%	0.0%
Junior	71,175	276	0.388%*	115	27,955	42,731	489	94	178	4	0.336%	0.417%*	0.818%	100.0%	0.0%
U16	26,155	116	0.444%*	131	11,178	14,939	38	49	66	1	0.438%	0.442%*	2.632%*†	100.0%	0.0%
U19	29,347	137	0.467%*	138	11,707	17,565	75	59	75	3	0.504%*	0.427%*	4.000%*†	100.0%	0.0%
DivIII	13,280	37	0.279%	82	2,491	8,351	2,438	5	22	10	0.201%	0.263%	0.410%	70.0%	30.0%
DivII	37,737	139	0.368%*	109	12,160	23,640	1,937	43	84	12	0.354%	0.355%	0.620%*	50.0%	50.0%
DivIA	33,405	152	0.455%*	135	11,924	21,300	181	57	95	0	0.478%*	0.446%*	0.000%	-	-
DivI	20,977	71	0.338%	100	8,605	12,363	9	33	38	0	0.383%	0.307%	0.000%	-	-
Unrated	4,996	13	0.260%	77	1,046	2,960	990	2	8	3	0.191%	0.270%	0.303%	0.0%	100.0%
E & Under	7,240	20	0.276%	82	1,606	4,467	1,167	1	15	4	0.062%	0.336%	0.343%	100.0%	0.0%
Open	53,670	249	0.464%*	137	7,280	36,458	9,932	39	153	57	0.536%*	0.420%*	0.574%*	63.2%	36.8%
21+	242	0	0.000%	0	38	160	44	0	0	0	0.000%	0.000%	0.000%	-	-
Vet40	1,545	4	0.259%	77	587	958	0	3	1	0	0.511%	0.104%	-	-	-
Vet50	2,751	6	0.218%	64	1,072	1,678	1	3	3	0	0.280%	0.179%	0.000%	-	-
Vet60	2,493	10	0.401%	119	962	1,531	0	5	5	0	0.520%	0.327%	-	-	-
Vet70	1,398	1	0.072%	21	517	880	1	0	1	0	0.000%	0.114%	0.000%	-	-
Vet80	181	0	0.000%	0	50	131	0	0	0	0	0.000%	0.000%	-	-	-
Veteran	12,007	34	0.283%	84	3,783	7,737	487	6	26	2	0.159%	0.336%	0.411%	50.0%	50.0%
Total	637,283	2,155	0.338%		225,639	378,682	32,962	746	1,266	143	0.331%	0.334%	0.434%	60.8%	39.2%

Note: * indicates statistical significance compared to the overall average of 0.3382% at the 95% confidence level, † indicates statistical significance compared to the row overall average at the 95% confidence level.

¹⁰ Many event sub-segments, such as all Veteran's Mixed events, did not have enough mixed DE bouts and/or a large enough difference in rates to be statistically significant at the 95% confidence level.

By Age and Gender

Analysis of age gaps and gender differences within DE bouts indicated that age and gender appeared to play a role in medical withdrawal rates, however the results are inconsistent and were not the sole drivers influencing medical withdrawal rates. Prior to the 2022–2023 season, the medical withdrawal rates for all gender DE bout types (female vs. female, male vs. male, and female vs. male “mixed”) were not statistically different from each other. However, as the growth of Mixed events has outpaced Men’s and Women’s event growth, so have the medical withdrawal rates for mixed DE bouts.



Differences in direct elimination bout medical withdrawal rates were statistically significant for only 21 out of 256 age and gender sub-segments relative to the overall mean, and 10 were statistically different from their row total mean (see the *DE Medical Withdrawal Rates by Age & Gender* table on the next page). DE bouts between fencers age 10 and under had some of the **lowest** medical withdrawal rates while DE bouts between many age 13 to 16 sub-segments had statistically significant **higher** medical withdrawal rates. Directionally, there were other trends which may or may not be sustained with the collection of additional DE bout data, such as DE bouts between those age 17 to 20 and those age 30+ which had some of the **highest** medical withdrawal rates but which were not statistically different from the overall mean.

It should be noted that there were very few DE bouts between those age 10 and under and those age 15 or older. Over the last six seasons there were 287 such DE bouts (about 48 per season) from which there were a total of zero (0) medical withdrawals (this is reflected in the large number of 0% values in the *DE Medical Withdrawal Rates by Age & Gender* table on the next page).

To provide context, consider three examples from the tables below.

- **Example A:** A female fencer age 11 to 12 versus a female fencer age 15 to 16. Out of the 4,676 DE bouts, there were 15 medical withdrawals (0.321% from the table *DE Bout Medical Withdrawal Rates by Age & Gender* on the next page) of which the fencer age 11 to 12 accounted for 53.3% (8 out of 15 from the table *Fencer Share of Medical Withdrawals*) of the medical withdrawals.
- **Example B:** A male fencer age 15 to 16 versus a male fencer age 19 to 20. Out of the 6,077 DE bouts, there were 23 medical withdrawals (0.379%) of which the fencer age 15 to 16 accounted for 69.6% (16 out of 23) of the medical withdrawals.

- **Example C:** A female fencer age 13 to 14 versus a male fencer age 30+. Out of the 570 DE bouts, there were 8 medical withdrawals (1.404%) of which the female fencer age 13 to 14 accounted for 37.5% (or 3 out of 8) of the medical withdrawals.

DE Bout Medical Withdrawal Rates by Age & Gender

		Opponent Age & Gender																Row Total	
		<10		11 to 12		13 to 14		15 to 16		17 to 18		19 to 20		21 to 29		30+			
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Fencer MW Rate by Age & Gender	<10	F	0.185%*	0.139%*	0.270%	0.164%	0.247%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.201%*	
		M	0.139%*	0.164%*	0.379%	0.238%*	0.000%	0.360%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.187%*	
	11 to 12	F	0.270%	0.379%	0.290%	0.439%	0.325%	0.499%	0.321%	0.000%	0.424%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.306%	
		M	0.164%	0.238%*	0.439%	0.265%*	0.590%	0.334%	1.136%	0.365%	0.000%	0.334%	0.000%	0.000%	0.000%	1.176%	0.000%	0.676%	0.288%*
	13 to 14	F	0.247%	0.000%	0.325%	0.590%	0.318%	0.784%*†	0.410%*	0.482%	0.396%	0.440%	0.491%	0.000%	0.538%	0.000%*†	0.175%	1.404%*†	0.362%
		M	0.000%	0.360%	0.499%	0.334%	0.784%*†	0.320%	0.294%	0.440%*	0.792%	0.346%	0.588%	0.248%	0.712%	0.270%	0.515%	0.513%	0.365%*
	15 to 16	F	0.000%	0.000%	0.321%	1.136%	0.410%*†	0.294%	0.381%	0.717%	0.396%	0.476%	0.280%	0.664%	0.421%	0.172%	0.150%*†	0.360%	0.385%*
		M	0.000%	0.000%	0.000%	0.365%	0.482%	0.440%*	0.717%	0.337%	0.332%	0.389%	0.415%	0.378%	0.000%*†	0.273%	0.536%	0.450%	0.378%*
	17 to 18	F	0.000%	0.000%	0.424%	0.000%	0.396%	0.792%	0.396%	0.332%	0.372%	0.246%	0.605%	0.000%	0.177%*†	0.252%	0.688%	1.099%	0.408%*
		M	0.000%	0.000%	0.000%	0.334%	0.440%	0.346%	0.476%	0.389%	0.246%	0.471%	0.476%	0.434%	0.680%	0.403%	1.661%	0.248%	0.404%*
	19 to 20	F			0.000%	0.000%	0.491%	0.588%	0.280%	0.415%	0.605%	0.476%	0.193%	0.356%	0.428%	0.244%	0.716%	1.068%	0.431%
		M		0.000%	0.000%	0.000%	0.000%	0.248%	0.664%	0.378%	0.000%	0.434%	0.356%	0.299%	1.119%	0.343%	0.431%	0.387%	0.367%
	21 to 29	F	0.000%	0.000%	0.000%	0.000%	0.538%	0.712%	0.421%	0.000%*†	0.177%	0.680%	0.428%	1.119%	0.325%	0.558%	0.317%	0.600%	0.406%
		M	0.000%	0.000%	0.000%	1.176%	0.000%*†	0.270%	0.172%	0.273%	0.252%	0.403%	0.244%	0.343%	0.558%	0.280%	0.207%	0.356%	0.315%
	30+	F	0.000%	0.000%	0.000%	0.000%	0.175%	0.515%	0.150%*	0.536%	0.688%	1.661%	0.716%	0.431%	0.317%	0.207%	0.251%	0.234%	0.295%
		M	0.000%	0.000%	0.000%	0.676%	1.404%*†	0.513%	0.360%	0.450%	1.099%	0.248%	1.068%	0.387%	0.600%	0.356%	0.234%	0.328%	0.374%

Note: * indicates statistical significance compared to the overall average of 0.3382% at the 95% confidence level. † indicates statistical significance compared to the row overall average at the 95% confidence level. Blank cells indicate there were no DE bouts for this sub-segment. 0.000% indicates there were DE bouts but zero medical withdrawals for this sub-segment.

Fencer Share of Medical Withdrawals

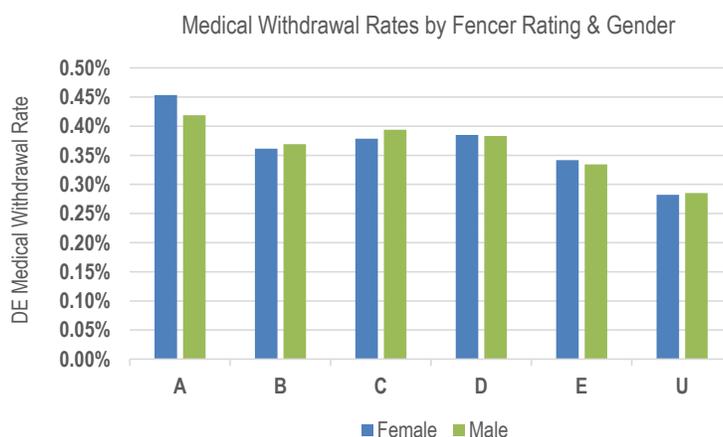
		Opponent Age & Gender																
		<10		11 to 12		13 to 14		15 to 16		17 to 18		19 to 20		21 to 29		30+		
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	
Fencer MW Rate by Age & Gender	<10	F		71.43%	100.00%	50.00%												
		M	28.57%		100.00%	56.52%	50.00%											
	11 to 12	F	28.95%	0.00%	43.75%	58.23%	33.33%	53.33%	100.00%									
		M	0.00%	43.48%	56.25%	40.00%	60.20%	0.00%	80.00%	100.00%					0.00%			0.00%
	13 to 14	F	50.00%		41.77%	60.00%	64.71%	41.35%	80.00%	41.94%	100.00%	83.33%		42.86%		33.33%	37.50%	
		M		50.00%	66.67%	39.80%	35.29%		0.00%	53.37%	33.33%	55.00%	0.00%	50.00%	0.00%	30.00%	50.00%	31.82%
	15 to 16	F		46.67%	100.00%	58.65%	100.00%		88.89%	49.12%	100.00%	28.57%	100.00%	80.00%	0.00%	0.00%	66.67%	
		M			20.00%	20.00%	46.63%	11.11%		50.00%	48.18%	0.00%	69.57%		50.00%	33.33%	32.35%	
	17 to 18	F		0.00%		58.06%	66.67%	50.88%	50.00%		100.00%	41.67%		66.67%	100.00%	20.00%	40.00%	
		M			0.00%	0.00%	45.00%	0.00%	51.82%	0.00%		0.00%	68.18%	0.00%	44.00%	40.00%	8.33%	
	19 to 20	F			16.67%	100.00%	71.43%	100.00%	58.33%	100.00%				0.00%	25.00%	100.00%	66.67%	33.33%
		M				50.00%	0.00%	30.43%		31.82%	100.00%		66.67%	61.54%	100.00%	55.56%		
	21 to 29	F				57.14%	100.00%	20.00%		33.33%	100.00%	75.00%	33.33%		66.67%	100.00%	66.67%	
		M			100.00%		70.00%	100.00%	50.00%	0.00%	56.00%	0.00%	38.46%	33.33%		100.00%	40.00%	
	30+	F				66.67%	50.00%	100.00%	66.67%	80.00%	60.00%	33.33%	0.00%	0.00%				66.67%
		M			100.00%	62.50%	68.18%	33.33%	67.65%	60.00%	91.67%	66.67%	44.44%	33.33%	60.00%	33.33%		

Note: Read the table from the perspective of the left (vertical) axis fencer. The percentage metrics are the % share of medical withdrawals for that cross-tab sub-segment attributed to the fencer on the left (vertical) axis. For example, if you want to see what share of medical withdrawals are attributed to 13 year old female when they fence 11 year old males, find the "13-14 - F" row on the left side of the table. Where this row crosses the "11 to 12 M" column, the % in the cell indicates the share of draws by the 13 year old female fencer (in this case 60%). Blank cells indicate there were either no medical withdrawals or there were no DE bouts.

For additional data tables, including raw counts for DE bouts and medical withdrawals by sub-segment, please see the Appendix.

By Rating

A comparison of medical withdrawal rates across all ratings and gender combinations showed distinctive rating-based trends, but those trends were not fundamentally different for female and male athletes. Medical withdrawal rates increased for both male and female fencers as they achieved higher ratings, except for a small decrease for B-rated fencers and C-rated female fencers. By the time a fencer achieved an A-rating, they were 51.7% more likely than an Unrated fencer to medical withdrawal from a DE bout.



Direct elimination medical withdrawal rates based on rating and gender were only statistically different from the overall mean medical withdrawal rate for female versus female and male versus male DE bouts. DE bouts between A-rated female fencers had a medical withdrawal rate of 0.503% (1 in 189 DE bouts) and those between A-rated males were 0.453% (1 in 221 DE bouts). At the other end of the spectrum, DE bout medical withdrawal rates between Unrated female fencers were 0.237% (1 in 422 DE bouts), and between Unrated male fencers were 0.254% (1 in 394 DE bouts), and were both statistically significant relative to the overall mean medical withdrawal rate of 0.338% (1 in 296 DE bouts).

DE bouts among the highest rated fencers (A-rated and B-rated) had a *higher* medical withdrawal rate of 0.410% (1 in 244 DE bouts) compared to the overall mean, and all combinations of A-rated and B-rated DE bouts showed that propensities for medical withdrawal were nearly evenly split between genders and ratings.¹¹ Identifying the reasons behind higher medical withdrawal rates for high-level fencers was not possible with the available data¹², however, it may be at least in part due to the wear and tear from a higher frequency of training and competition, strategic decision making (e.g. the fencer has an event the next day, is performing poorly and doesn't want it on their record, etc.), or other factors that logically are more likely to apply to high-level fencers more so than those new to the sport.

At a more granular level there were some directional trends but all such trends had notable exceptions. For example, generally speaking A-rated through D-rated fencers of both genders were *less* likely to be the medically withdrawing fencer when facing E-rated and Unrated female fencers. This trend was also present with E-rated and Unrated male fencers, but to a lesser degree. Additionally, DE bouts between Unrated fencers had some of the *lowest* medical withdrawal rates, and mixed gender DE bouts between Unrated fencers were nearly evenly split

¹¹ All A and B rating and gender combination medical withdrawal splits were between 48.7% and 51.4%, with one exception (an A-rated female versus a B-rated male) where there was 1 medical withdrawal out of 117 DE bouts which was by the female fencer. In total, there were 480 mixed gender DE bouts between A-rated and B-rated fencers, but only 1 medical withdrawal.

¹² Data addressing training volumes are not captured anywhere at scale and any such data would likely not be consistently recorded with regard to key factors such as actual fencing time, intensity, etc.

by which gender was more likely to be the medically withdrawing fencer (50.8% of the time it was the female fencer).

DE Bout Medical Withdrawal Rates by Rating & Gender

		Opponent Rating & Gender														Row Total
		A		B		C		D		E		U				
		F	M	F	M	F	M	F	M	F	M	F	M			
Fencer Rating & Gender	A	F	0.503%*	0.000%	0.354%	0.855%	0.365%	0.000%	0.428%	1.515%	0.494%	0.000%	0.653%	1.818%	0.453%*	
		M	0.000%	0.452%*	0.000%	0.381%	0.000%	0.420%	0.917%	0.388%	0.926%	0.339%	0.862%	0.348%	0.419%*	
	B	F	0.354%	0.000%	0.267%	0.000%	0.314%	1.242%	0.422%	0.000%	0.503%	0.775%	0.428%	1.070%	0.361%	
		M	0.855%	0.381%	0.000%	0.416%	0.526%	0.325%	1.130%	0.320%	0.000%	0.373%	0.674%	0.352%	0.369%	
	C	F	0.365%	0.000%	0.314%	0.526%	0.465%	0.388%	0.333%	0.408%	0.372%	0.837%	0.372%	0.571%	0.378%	
		M	0.000%	0.420%	1.242%	0.325%	0.388%	0.398%	0.692%	0.474%*	0.267%	0.355%	0.231%	0.385%	0.394%*	
	D	F	0.428%	0.917%	0.422%	1.130%	0.333%	0.692%	0.382%	1.124%	0.379%	0.496%	0.365%	0.242%	0.385%	
		M	1.515%	0.388%	0.000%	0.320%	0.408%	0.474%*	1.124%	0.401%	0.423%	0.295%	0.785%	0.348%	0.383%	
	E	F	0.494%	0.926%	0.503%	0.000%	0.372%	0.267%	0.379%	0.423%	0.281%	0.559%	0.272%	0.541%	0.342%	
		M	0.000%	0.339%	0.775%	0.373%	0.837%	0.355%	0.496%	0.295%	0.559%	0.300%	0.567%	0.325%	0.334%	
	U	F	0.653%†	0.862%	0.428%	0.674%	0.372%	0.231%	0.365%	0.785%	0.272%	0.567%	0.237%†	0.343%	0.282%*	
		M	1.818%	0.348%	1.070%	0.352%	0.571%	0.385%	0.242%	0.348%	0.541%	0.325%	0.343%	0.254%†	0.285%*	

Note: * indicates statistical significance compared to the overall average of 0.3382% at the 95% confidence level. † indicates statistical significance compared to the row overall average at the 95% confidence level (none were significant).

Fencer Share of Medical Withdrawals

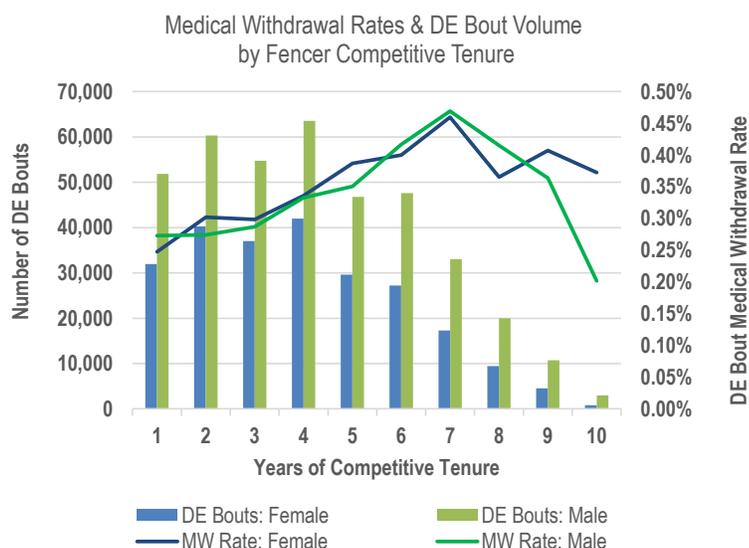
		Opponent Rating & Gender													
		A		B		C		D		E		U			
		F	M	F	M	F	M	F	M	F	M	F	M		
Fencer Rating & Gender	A	F			48.72%	100.00%	40.00%		50.00%	0.00%	40.00%		28.57%	50.00%	
		M				51.35%		51.85%	0.00%	43.48%	0.00%	35.71%	0.00%	56.25%	
	B	F	51.28%				40.00%	50.00%	62.50%		31.82%	0.00%	56.52%	0.00%	
		M	0.00%	48.65%			0.00%	52.00%	50.00%	67.86%		48.00%	0.00%	33.33%	
	C	F	60.00%		60.00%	100.00%		100.00%	59.38%	100.00%	48.28%	50.00%	31.71%	33.33%	
		M		48.15%	50.00%	48.00%	0.00%		0.00%	52.63%	0.00%	64.44%	0.00%	36.36%	
	D	F	50.00%	100.00%	37.50%	50.00%	40.63%	100.00%		60.00%	31.43%	50.00%	33.33%	100.00%	
		M	100.00%	56.52%		32.14%	0.00%	47.37%	40.00%		0.00%	54.76%	22.22%	46.15%	
	E	F	60.00%	100.00%	68.18%		51.72%	100.00%	68.57%	100.00%		20.00%	39.66%	60.00%	
		M		64.29%	100.00%	52.00%	50.00%	35.56%	50.00%	45.24%	80.00%		8.33%	47.22%	
	U	F	71.43%	100.00%	43.48%	100.00%	68.29%	100.00%	66.67%	77.78%	60.34%	91.67%		50.77%	
		M	50.00%	43.75%	100.00%	66.67%	66.67%	63.64%	0.00%	53.85%	40.00%	52.78%	49.23%		

Note: Read the table from the perspective of the left (vertical) axis fencer. The percentage metrics are the % share of medical withdrawals for that cross-tab sub-segment attributed to the fencer on the left (vertical) axis. For example, if you want to see what share of medical withdrawals are attributed to B-rated female when they fence E-rated females, find the "B - F" row on the left side of the table. Where this row crosses the "E - F" column, the % in the cell indicates the share of withdraws by the B-rated female fencer (in this case 31.82%). Blank cells indicate there were either no medical withdrawals or there were no DE bouts.

For additional data tables, including raw counts for DE bouts and medical withdrawals by sub-segment, please see the Appendix.

By Competitive Tenure

Analysis of direct elimination bouts over the last six seasons revealed that the medical withdrawal rates increased with competitive tenure until the seventh year as an active competitor.¹³ For those in their first year as a competitive athlete, the medical withdrawal rate was relatively low at 0.263% (1 in 380 DE bouts). This steadily increased to 0.334% (1 in 299 DE bouts) in the fourth year, nearly matching the overall mean of 0.338%, and peaking in the seventh year at 0.466% (1 in 215 DE bouts). Up to the seventh year, these trends were similar for both male and female fencers as can be seen in the chart to the right.



After the seventh year the medical withdrawal rates decreased for both male and female fencers, but the decrease was substantially greater for males. By the tenth year of competitive tenure, the medical withdrawal rate for males dropped by 57.0% versus 19.0% for females, compared to their peaks in year seven. In fact, for males with 10+ years of competitive tenure, their medical withdrawal rate was 26.0% **lower** than male competitors in their first year while females with 10+ years of competitive tenure had a medical withdrawal rate 50.6% **higher** than female competitors in their first year.

As shown on the table on the next page, the largest concentration of statistically significant medical withdrawal rates relative to the overall mean were between fencers with one to three years of competitive tenure, all of which were **lower**. Conversely, there were multiple sub-segments that had **higher** medical withdrawal rates that were statistically different from the overall mean medical withdrawal rate, all of which were same-gender sub-segments. Based on the overall competitive tenure, male fencers with 10+ years of competitive tenure had the lowest medical withdrawal rate at 0.202% (1 in 495 DE bouts).

¹³ "Competitive Tenure" was based on the number of years with a competitive membership, as recorded in the USA Fencing Member Database, at the time of each direct elimination bout. This was calculated by comparing the date of each direct elimination bout to the first date that a fencer had a membership type that permitted participation at the local, collegiate, high school, regional, national, or international level. This includes Access, Competitive, International Competitive, College Competitive, High School Competitive, Coach, Life, Life Installment, Olympian, Para Olympian membership types.

DE Bout Medical Withdrawal Rates by Competitive Tenure & Gender

Row Total	Opponent Competitive Tenure & Gender																			
	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10+	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Year 1	F 0.41%	M 0.38%	F 0.29%	M 0.26%	F 0.18%	M 0.16%	F 0.00%	M 0.00%	F 0.22%	M 0.17%	F 0.46%	M 0.29%	F 0.41%	M 0.13%	F 0.28%	M 0.00%	F 0.66%	M 0.00%	F 0.00%	M 0.00%
Year 2	F 0.23%	M 0.49%	F 0.30%	M 0.34%	F 0.19%	M 0.19%	F 0.10%	M 0.09%	F 0.10%	M 0.09%										
Year 3	F 0.86%	M 0.69%	F 0.43%	M 0.28%	F 0.23%	M 0.14%	F 0.23%	M 0.14%												
Year 4	F 0.22%	M 0.32%	F 0.30%	M 0.28%	F 0.19%	M 0.19%	F 0.10%	M 0.09%	F 0.10%	M 0.09%										
Year 5	F 0.52%	M 0.55%	F 0.31%	M 0.31%	F 0.10%	M 0.10%	F 0.10%	M 0.10%												
Year 6	F 0.46%	M 0.27%	F 0.29%	M 0.23%	F 0.19%	M 0.14%	F 0.23%	M 0.14%												
Year 7	F 0.41%	M 0.80%	F 0.36%	M 0.42%	F 0.23%	M 0.14%	F 0.23%	M 0.14%												
Year 8	F 0.00%	M 0.22%	F 0.00%	M 0.00%	F 0.00%	M 0.00%														
Year 9	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%
Year 10+	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%	F 0.00%	M 0.00%

Note: * indicates statistical significance compared to the overall average of 0.338% at the 98% confidence level. † indicates statistical significance compared to the row total average at the 95% confidence level.

Fencer Share of DE Bout Medical Withdrawals by Competitive Tenure & Gender

Row Total	Opponent Competitive Tenure & Gender																			
	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10+	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Year 1	F 43.8%	M 56.3%	F 41.7%	M 55.3%	F 44.8%	M 50.0%	F 48.5%	M 50.0%												
Year 2	F 37.5%	M 58.3%	F 33.3%	M 44.7%	F 50.0%	M 50.0%														
Year 3	F 56.3%	M 57.1%	F 41.2%	M 33.3%	F 56.5%	M 50.0%	F 57.1%	M 50.0%	F 56.5%	M 50.0%	F 57.1%	M 50.0%	F 56.5%	M 50.0%	F 57.1%	M 50.0%	F 56.5%	M 50.0%	F 57.1%	M 50.0%
Year 4	F 53.3%	M 55.2%	F 50.0%	M 50.0%	F 51.5%	M 50.0%	F 57.5%	M 50.0%	F 38.9%	M 50.0%	F 52.0%	M 50.0%								
Year 5	F 38.9%	M 100.0%	F 41.2%	M 100.0%	F 38.9%	M 100.0%	F 50.0%	M 100.0%												
Year 6	F 38.5%	M 100.0%	F 52.9%	M 66.7%	F 59.1%	M 66.7%	F 66.7%	M 66.7%												
Year 7	F 33.3%	M 100.0%	F 33.3%	M 33.3%	F 40.0%	M 55.9%														
Year 8	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%	F 100.0%	M 0.0%
Year 9	F 50.0%	M 66.7%	F 0.0%	M 66.7%	F 33.3%	M 33.3%														
Year 10+	F 50.0%	M 66.7%	F 50.0%	M 50.0%																

Note: Read the table from the perspective of the left (vertical) axis fencer. The percentage metrics are the % share of medical withdrawals for that cross-tab sub-segment attributed to the fencer on the left (vertical) axis. For example, if you want to see what share of medical withdrawals are attributed to a females who has been competing for 6 years, when they fence females who have been competing for 3 years, find the "Year 6 - F" row on the left side of the table. Where this row crosses the "Year 3 - F" column, the % in the cell indicates the share of withdrawals by the female fencer who has been fencing competitively for 6 years (in this case 59.1%). Blank cells indicate there were either no medical withdrawals or there were no DE bouts.

For additional data tables, including raw counts for DE bouts and medical withdrawals by sub-segment, please see the Appendix.

Conclusions

Despite the overall low medical withdrawal rate, analysis of the available data revealed trends and relative hotspots that can inform USA Fencing's efforts to keep medical withdrawal rates low as the sport continues to grow. The data from over six hundred thousand direct elimination bouts indicated that there was no single factor driving medical withdrawals. There was instead a common thread across the data views in this analysis that indicates a combination of factors common to all athletic endeavors: more events, against more skilled and more experienced competitors, with more at stake, leads to higher medical withdrawal rates. This analysis also demonstrates opportunities for improved data collection to support more useful analysis in the future.

Data analysis identified directional trends and athlete sub-segments with elevated medical withdrawal rates which could be focal points for future safety initiatives. However, as there were few truly consistent patterns and the reasons behind medical withdrawals are not identifiable at this time, broadly applicable safety and education programs may be more effective. Among the statistically significant findings, fencing's youngest and newest competitors were among those *least* likely to medical withdrawal. This finding should calm injury concerns expressed by some parents of younger fencers and those new to the sport, while encouraging competition and fencing's current growth trajectory.

Of keen interest to many in the fencing community, the data showed inconsistent impacts of gender, age, and other differences between fencers who competed in Mixed events. A comparison of foil and épée based on age and gender indicated that medical withdrawal rates appear to be primarily driven by factors other than age or gender. The collection of more detailed information will be necessary to understand what truly drives medical withdrawals or actual injuries.

As there are many non-injury reasons for a medical withdrawal, the ability to understand injury rates and contributing factors will require changes to how medical withdrawals and bout data are recorded. To enable tracking of injury rates, USA Fencing, Fencing Time Live, and AskFred should evaluate the feasibility of capturing high level categories of medical withdrawals, retaining the scores at the time of medical withdrawal, the time of the medical withdrawal, and recording the period and time remaining in the bout. Each of these data points would be highly useful in the measurement of injury rates, injury scenarios, and understanding contributing factors. Additionally, if these data recording changes can also be applied to pool bouts, we could gain a more comprehensive understanding of medical withdrawals at all stages of competition.

We would like to thank Fencing Time Live for their support and data contributions to this analysis, without which this report would not have been possible.

Allez!

Appendix

By Age and Gender

The following table shows the number of direct elimination bouts between the fencer by age and gender sub-segment versus the opponent by age and gender sub-segment. For example, there were 2,376 DE bouts between female fencers age 21 to 29 versus female fencers age 15 to 16.

Total DE Bouts		Opponent Age & Gender																Row Total	
		<10		11 to 12		13 to 14		15 to 16		17 to 18		19 to 20		21 to 29		30+			
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Fencer MW Rate by Age & Gender	<10	F	19,456	5,049	14,065	1,221	1,622	102	120	8	4	3	0	0	1	2	13	9	41,675
		M	5,049	29,851	1,321	19,317	98	2,225	6	67	2	8	0	5	4	4	7	24	57,988
	11 to 12	F	14,065	1,321	24,823	3,646	24,317	1,203	4,676	103	472	13	54	5	23	17	62	26	74,826
		M	1,221	19,317	3,646	32,110	848	29,353	88	4,109	15	299	4	52	13	85	25	148	91,333
	13 to 14	F	1,622	98	24,317	848	27,359	2,168	32,447	1,038	7,830	455	1,223	213	1,302	414	1,718	570	103,622
		M	102	2,225	1,203	29,353	2,168	42,150	1,020	47,304	379	11,560	170	2,419	281	3,697	388	4,286	148,705
	15 to 16	F	120	6	4,676	88	32,447	1,020	21,287	1,255	14,388	630	2,504	301	2,376	581	2,661	834	85,174
		M	8	67	103	4,109	1,038	47,304	1,255	40,319	602	28,314	241	6,077	432	8,062	560	7,551	146,042
	17 to 18	F	4	2	472	15	7,830	379	14,388	602	4,304	406	1,984	256	1,693	397	1,454	455	34,641
		M	3	8	13	299	455	11,560	630	28,314	406	9,770	210	5,064	294	6,211	301	4,829	68,367
	19 to 20	F	0	0	54	4	1,223	170	2,504	241	1,984	210	518	281	935	410	419	281	9,234
		M	0	5	5	52	213	2,419	301	6,077	256	5,064	281	1,340	268	3,788	232	2,326	22,627
	21 to 29	F	1	4	23	13	1,302	281	2,376	432	1,693	294	935	268	616	538	946	500	10,222
		M	2	4	17	85	414	3,697	581	8,062	397	6,211	410	3,788	538	3,571	482	5,622	33,881
	30+	F	13	7	62	25	1,718	388	2,661	560	1,454	301	419	232	946	482	7,967	1,281	18,516
		M	9	24	26	148	570	4,286	834	7,551	455	4,829	281	2,326	500	5,622	1,281	16,765	45,507
	Grand Total																		637,283

The following table shows the number of direct elimination bouts between the fencer by age and gender sub-segment versus the opponent by age and gender sub-segments where there was a medical withdrawal. For example, there were 10 medical withdrawals between female fencers age 21 to 29 versus female fencers age 15 to 16.

Total Medical Withdrawals		Opponent Age & Gender																Row Total	
		<10		11 to 12		13 to 14		15 to 16		17 to 18		19 to 20		21 to 29		30+			
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Fencer MW Rate by Age & Gender	<10	F	36	7	38	2	4	0	0	0	0	0	0	0	0	0	0	0	87
		M	7	49	5	46	0	8	0	0	0	0	0	0	0	0	0	0	115
	11 to 12	F	38	5	72	16	79	6	15	0	2	0	0	0	0	0	0	0	233
		M	2	46	16	85	5	98	1	15	0	1	0	0	0	1	0	1	271
	13 to 14	F	4	0	79	5	87	17	133	5	31	2	6	0	7	0	3	8	387
		M	0	8	6	98	17	135	3	208	3	40	1	6	2	10	2	22	561
	15 to 16	F	0	0	15	1	133	3	81	9	57	3	7	2	10	1	4	3	329
		M	0	0	0	15	5	208	9	136	2	110	1	23	0	22	3	34	568
	17 to 18	F	0	0	2	0	31	3	57	2	16	1	12	0	3	1	10	5	143
		M	0	0	0	1	2	40	3	110	1	46	1	22	2	25	5	12	270
	19 to 20	F	0	0	0	0	6	1	7	1	12	1	1	1	4	1	3	3	41
		M	0	0	0	0	6	2	23	0	22	1	4	3	13	1	9	84	
	21 to 29	F	0	0	0	0	7	2	10	0	3	2	4	3	2	3	3	3	42
		M	0	0	0	1	0	10	1	22	1	25	1	13	3	10	1	20	108
	30+	F	0	0	0	0	3	2	4	3	10	5	3	1	3	1	20	3	58
		M	0	0	0	1	8	22	3	34	5	12	3	9	3	20	3	55	178
	Grand Total																		2,155

By Rating

The following table shows the number of direct elimination bouts between the fencer by rating and gender sub-segment versus the opponent by rating and gender sub-segment. For example, there were 5,689 DE bouts between D-rated female fencers versus B-rated female fencers.

Total DE Bouts		Opponent Rating & Gender														Row Total
		A		B		C		D		E		U				
		F	M	F	M	F	M	F	M	F	M	F	M			
Fencer Rating & Gender	A	F	11,322	105	11,004	117	6,857	106	3,273	66	2,025	65	2,143	110	37,193	
		M	105	21,883	109	19,409	147	12,870	109	5,924	108	4,124	232	4,597	69,617	
	B	F	11,004	109	5,247	149	9,563	161	5,689	102	4,377	129	5,376	187	42,093	
		M	117	19,409	149	8,176	190	15,386	177	8,738	231	6,698	445	8,512	68,228	
	C	F	6,857	147	9,563	190	6,239	258	9,604	245	7,799	239	11,025	525	52,691	
		M	106	12,870	161	15,386	258	11,057	289	16,038	375	12,687	865	17,151	87,243	
	D	F	3,273	109	5,689	177	9,604	289	4,716	445	9,228	403	14,798	825	49,556	
		M	66	5,924	102	8,738	245	16,038	445	7,723	473	14,236	1,147	22,435	77,572	
	E	F	2,025	108	4,377	231	7,799	375	9,228	473	5,342	895	21,349	1,849	54,051	
		M	65	4,124	129	6,698	239	12,687	403	14,236	895	8,670	2,116	33,182	83,444	
	U	F	2,143	232	5,376	445	11,025	865	14,798	1,147	21,349	2,116	68,663	18,968	147,127	
		M	110	4,597	187	8,512	525	17,151	825	22,435	1,849	33,182	18,968	119,186	227,527	
Grand Total														637,283		

Note: Row totals are accurate counts for the Fencer, but the sum of row totals is greater than the true Grand Total as there are redundant counts in the table.

The following table shows the number of direct elimination bouts between the fencer by rating and gender sub-segment versus the opponent by age and gender sub-segment where there was a medical withdrawal. For example, there were 24 medical withdrawals between D-rated female fencers versus B-rated female fencers.

Total Medical Withdrawals		Opponent Rating & Gender														Row Total
		A		B		C		D		E		U				
		F	M	F	M	F	M	F	M	F	M	F	M			
Fencer Rating & Gender	A	F	57	0	39	1	25	0	14	1	10	0	14	2	163	
		M	0	99	0	74	0	54	1	23	1	14	2	16	284	
	B	F	39	0	14	0	30	2	24	0	22	1	23	2	157	
		M	1	74	0	34	1	50	2	28	0	25	3	30	248	
	C	F	25	0	30	1	29	1	32	1	29	2	41	3	194	
		M	0	54	2	50	1	44	2	76	1	45	2	66	343	
	D	F	14	1	24	2	32	2	18	5	35	2	54	2	191	
		M	1	23	0	28	1	76	5	31	2	42	9	78	296	
	E	F	10	1	22	0	29	1	35	2	15	5	58	10	188	
		M	0	14	1	25	2	45	2	42	5	26	12	108	282	
	U	F	14	2	23	3	41	2	54	9	58	12	163	65	446	
		M	2	16	2	30	3	66	2	78	10	108	65	303	685	
Grand Total														2,155		

Note: Row totals are accurate counts for the Fencer, but the sum of row totals is greater than the true Grand Total as there are redundant counts in the table.

By Competitive Tenure

The following table shows the number of direct elimination bouts between the fencer by competitive tenure and gender sub-segment versus the opponent by competitive tenure and gender sub-segment. For example, there were 2,603 DE bouts between female fencers in their 7th season of competitive tenure versus female fencers in their 2nd season of competitive tenure.

Total DE Bouts		Opponent Competitive Tenure & Gender																				Row Total	
		Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10+			
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Fencer Competitive Tenure & Gender	Year 1	F	8,531	4,160	13,384	2,305	8,613	1,111	6,540	582	3,405	304	2,814	337	1,452	291	692	173	330	108	126	86	55,344
		M	4,160	13,939	2,434	21,220	1,149	13,779	622	10,940	358	6,444	360	5,935	250	3,878	156	2,252	75	1,181	56	583	89,771
	Year 2	F	13,384	2,434	10,333	2,312	13,992	1,042	10,688	586	5,487	290	4,062	277	2,603	259	1,226	203	606	136	153	69	70,142
		M	2,305	21,220	2,312	14,107	1,041	20,016	497	16,467	290	9,146	245	7,463	249	5,280	146	3,276	100	1,692	44	645	106,541
	Year 3	F	8,613	1,149	13,992	1,041	8,096	760	12,340	448	7,108	232	5,922	228	2,773	170	1,851	164	754	94	143	45	65,923
		M	1,111	13,779	1,042	20,016	760	11,095	527	18,010	222	10,545	228	9,780	117	4,918	121	3,469	85	1,973	35	544	98,377
	Year 4	F	6,540	622	10,688	497	12,340	527	14,986	690	8,503	188	6,928	190	3,629	139	1,266	92	883	92	115	39	68,954
		M	582	10,940	586	16,467	448	18,010	690	22,042	199	12,271	211	11,119	140	6,462	52	2,393	63	1,869	23	507	105,074
	Year 5	F	3,405	358	5,487	290	7,108	222	8,503	199	9,742	264	7,192	201	3,996	145	1,750	79	367	40	98	26	49,472
		M	304	6,444	290	9,146	232	10,545	188	12,271	264	14,842	238	12,185	108	6,974	60	3,262	24	883	16	434	78,710
	Year 6	F	2,814	360	4,062	245	5,922	228	6,928	211	7,192	238	8,584	372	4,862	186	2,342	114	972	65	163	40	45,900
		M	337	5,935	277	7,463	228	9,780	190	11,119	201	12,185	372	15,005	167	9,503	87	4,665	34	2,029	24	632	80,233
	Year 7	F	1,452	250	2,603	249	2,773	117	3,629	140	3,996	108	4,862	167	5,050	281	2,428	82	1,052	58	216	32	29,545
		M	291	3,878	259	5,280	170	4,918	139	6,462	145	6,974	186	9,503	281	9,546	97	5,193	58	2,429	28	675	56,512
	Year 8	F	692	156	1,226	146	1,851	121	1,266	52	1,750	60	2,342	87	2,428	97	2,539	171	1,073	74	185	29	16,345
		M	173	2,252	203	3,276	164	3,469	92	2,393	79	3,262	114	4,665	82	5,193	171	5,476	73	2,601	33	748	34,519
	Year 9	F	330	75	606	100	754	85	883	63	367	24	972	34	1,052	58	1,073	73	1,144	116	102	36	7,947
		M	108	1,181	136	1,692	94	1,973	92	1,869	40	883	65	2,029	58	2,429	74	2,601	116	2,698	25	571	18,734
	Year 10+	F	126	56	153	44	143	35	115	23	98	16	163	24	216	28	185	33	102	25	11	4	1,600
		M	86	583	69	645	45	544	39	507	26	434	40	632	32	675	29	748	36	571	4	100	5,845
Grand Total																						631,677	

Note: Row totals are accurate counts for the Fencer, but the sum of row totals is greater than the true Grand Total as there are redundant counts in the table.

The following table shows the number of direct elimination bouts between the fencer by competitive tenure and gender sub-segment versus the opponent by competitive tenure and gender sub-segment where there was a medical withdrawal. For example, there were 9 medical withdrawals between female fencers in their 7th season of competitive tenure versus female fencers in their 2nd season of competitive tenure.

Total Medical Withdrawals		Opponent Competitive Tenure & Gender																				Row Total	
		Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10+			
		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M		
Fencer Competitive Tenure & Gender	Year 1	F	12	16	32	6	16	0	15	1	18	3	13	1	6	3	2	0	2	0	0	0	146
		M	16	34	12	47	7	29	2	33	2	19	1	19	2	17	1	5	0	3	0	0	249
	Year 2	F	32	12	31	8	34	2	33	4	17	2	17	1	9	2	5	1	2	0	0	0	212
		M	6	47	8	34	3	46	1	47	3	25	3	32	1	13	2	20	0	6	0	0	297
	Year 3	F	16	7	34	3	19	3	35	1	36	2	22	1	10	1	6	2	3	0	1	0	202
		M	0	29	2	46	3	27	1	61	2	33	3	34	0	20	0	15	1	8	0	2	287
	Year 4	F	15	2	33	1	35	1	53	5	35	1	25	0	11	3	6	0	3	0	0	0	229
		M	1	33	4	47	1	61	5	69	0	42	0	46	1	23	0	10	1	5	0	5	354
	Year 5	F	18	2	17	3	36	2	35	0	31	2	26	1	15	2	7	1	0	0	0	0	198
		M	3	19	2	25	2	33	1	42	2	51	0	44	0	33	0	15	0	4	0	1	277
	Year 6	F	13	1	17	3	22	3	25	0	26	0	27	1	31	2	10	2	7	0	1	0	191
		M	1	19	1	32	1	34	0	46	1	44	1	68	2	42	1	23	0	11	0	2	329
	Year 7	F	6	2	9	1	10	0	11	1	15	0	31	2	29	2	8	1	0	0	2	0	130
		M	3	17	2	13	1	20	3	23	2	33	2	42	2	55	1	22	0	14	0	0	255
	Year 8	F	2	1	5	2	6	0	6	0	7	0	10	1	8	1	7	2	3	0	1	0	62
		M	0	5	1	20	2	15	0	10	1	15	2	23	1	22	2	18	0	11	0	0	148
	Year 9	F	2	0	2	0	3	1	3	1	0	0	7	0	0	0	3	0	7	0	1	0	30
		M	0	3	0	6	0	8	0	5	0	4	0	11	0	14	0	11	0	7	0	2	71
	Year 10+	F	0	0	0	0	1	0	0	0	0	0	1	0	2	0	1	0	1	0	0	0	6
		M	0	0	0	0	0	2	0	5	0	1	0	2	0	0	0	0	0	2	0	0	12
Grand Total																						2,132	

Note: Row totals are accurate counts for the Fencer, but the sum of row totals is greater than the true Grand Total as there are redundant counts in the table.



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