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Original research

The cost of injury in Ladies Gaelic football: A nine-year analysis (2012–2020) of the LGFA's Injury Fund

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ABSTRACT

Objectives: Ladies Gaelic football is a popular women's sport in Ireland and internationally. An injury fund is available to Ladies Gaelic football players for claims to cover excess medical bills/lost wages, facilitating a longitudinal analysis of claim data over time. This study aimed to report Ladies Gaelic football injury claim numbers, rates, and associated costs, and consider claim trends over time.

Design: Descriptive epidemiology study.

Methods: All approved injury claims from Ladies Gaelic football players between 2012 and 2020 were analysed. The frequency of injury claims, cost of the injury fund, and specific treatment expenses were calculated for the overall sample, and for adults and youths. Claim rates per 1000 players, per 1000 adults and per 1000 youths were calculated and Poisson regression was used to examine trends over time.

Results: A total of €6,200,557.68 was allocated to 9348 claims, averaging €663.30 ± 1387.15 per claim. There were 12.98 (95 % confidence interval 12.72–13.25) claims per 1000 players and 1.15 (95 % confidence interval 1.12–1.17) per club. No significant injury trends over time were observed whilst the average inflation-adjusted claim cost increased by 71.9 %. Lower extremity injuries accounted for most claims (63.8 %) and most costs (83.4 %). The knee, ankle and hamstring were most frequently injured and knee injuries accounted for 70 % of injury costs.

Conclusions: Claim rates remained prevalent between 2012 and 2020 though average claim costs increased substantially during this time. Investment towards injury prevention strategies targeting lower extremity injuries, particularly knee injuries, is strongly supported by these data.

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Practical implications

- Injury has remained consistent over the past 9 years in Ladies Gaelic football and the mean cost of inflation-adjusted claims has increased by 72 %.
- Lower extremity injuries are dominant, particularly to the knee, ankle, and hamstring.
- Knee injuries account for more than a quarter of all claims, 70 % of all costs and are responsible for almost 4 in 5 hospitalisations. Whilst ACL injuries account for 1 in 12 claims, they represent two thirds of the hospitalisation costs.
- These findings can help inform the design and national roll-out of an injury prevention strategy to reduce injury risk in Ladies Gaelic footballers.
- Future prospective longitudinal injury surveillance is needed and injury risk reduction strategies should be invested that target lower extremity injuries, especially knee and ACL injuries.

1. Introduction

Ladies Gaelic football is one of Ireland's national sports, played exclusively by women and governed by the Ladies Gaelic Football Association (LGFA).¹ It is the most played and watched women's sport in Ireland and one of the fastest growing women's sports in Europe. Ladies Gaelic football is a field sport, played for 60 min (two 30-minute halves) by two teams of 15 players competing to score the most points. Points are scored by either putting the ball underneath the crossbar and between the posts (3 points) or putting it over the crossbar and between the posts (1 point).^{1,2} Gaelic football has been described as a multi-directional, high-velocity sport in which players must be able to sprint, jump, catch, turn, kick, tackle, hand-pass and solo the ball (whilst moving with the ball, the player must kick the ball back into their hands every 3 steps).^{1,3} These demands inevitably come with a risk of injuries, which can be a significant burden for players due to their physical, financial, and psychological impact.⁴ Injuries in adolescents in particular can lead to drop-out from sport, negatively impacting long-term health.⁵

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Many studies have examined injury in men's Gaelic football,^{3,6,7} but only three have focused on women Gaelic footballers,^{1,2,8} examining injury in a low number of players over short periods of just one or two seasons. One previous study, a retrospective questionnaire of 74 US Ladies Gaelic footballers reported lower extremity injuries were most frequent (47%), followed by upper extremity (35%), and non-limb injuries (18%).⁸ A retrospective review of 245 insurance claims submitted by Ladies Gaelic footballers over one season, found 58% of injuries affected the lower extremity, 24% the upper extremity and 18% involved the head, neck, or trunk.² Just one prospective study has been completed, looking at injury in collegiate Ladies Gaelic footballers over 2 seasons.¹ This study reported an injury rate of 17.9 injuries per 1000 h. Lower extremity injuries were predominant (67%), with hamstring (21.5%), knee (12.7%), quadriceps (11.4%), and ankle (10.3%) injuries occurring most frequently.

The LGFA Injury Fund (hereafter called the Injury Fund) is an injury scheme administered by the LGFA that aims to lessen the hardship of injury on players, officials, and coaching staff by reimbursing the medical expenses incurred due to an injury sustained during a game or training session in Ireland and Britain. The Injury Fund is financed by the registration fees of members. If a member has purchased their own private health insurance, the Injury Fund is used to cover excess medical expenses. Injured parties are required to submit an injury claim form to the LGFA for assessment. Once approved, the Injury Fund reimburses medical expenses up to €5500, dental expenses up to €3000 and loss of wages up to €200 per week for a maximum of 20 weeks. In men's Gaelic football, injury claim data from the GAA Injury Scheme 2007–2014 revealed that on average 2.92 ± 0.78 claims occurred per club annually with a mean cost of $\text{€}1158.40 \pm 192.81$.⁷ No similar information has yet been published for Ladies Gaelic football.

This study aims to describe injury trends and financial burden in Ladies Gaelic footballers using data from the LGFA Injury Fund from 2012 to 2020. With this, we will produce the first long-term analysis of injury in Ladies Gaelic football as well as presenting the first data on the costs that these injuries incur. This study provides important information towards the design of prevention strategies that target injuries of highest impact, whether by frequency, by cost or both.

2. Methods

Ethical approval for this study was granted by Dublin City University's Research Ethics Committee. Injury Fund data are reported each year in October and include all approved injury claims from the previous 12 months. Only players from Ireland and Britain are included in the Injury Fund. For an injury claim to be approved, the injury must have occurred whilst taking part in Ladies Gaelic football. Following injury, a claim form must be submitted within 2 months, signed by the injured player, team trainer, club secretary and county secretary as a declaration of authenticity and include all relevant documentation. The documentation required includes: 1) proof from the employer of lost wages, 2) copy of the referee's report if the injury was sustained during an official game, 3) signature from the official in charge of the team if the injury occurred in a training session or practice game, 4) letter from the appropriate secretary as to whether permission had been granted for a practice game if the injury occurred in a practice game and 5) all original receipts for the treatment received. Claims are reimbursed once treatment is completed and all receipts and required documentation are provided. Claims are included in the year in which they are paid by the LGFA.

All approved injury claims contained in the LGFA's internal annual reports from 2012 to 2020 were included in this descriptive epidemiological study. Total player and club numbers in Ireland and Britain for each year were provided by the LGFA. Anonymised claim data was extracted from the LGFA's database and provided to the research team in a Microsoft Excel spreadsheet. Data included information on age group (adult/youth), anatomical location of the injury (e.g., knee,

ankle), total cost of injury (including lost wages) and the specific medical expenses incurred in the treatment of that injury (e.g., healthcare professional, surgery, imaging). A healthcare professional was defined as an athletic therapist/physiotherapist, general practitioner (physician), consultant, anaesthetic consultant, or dentist.

Analysis of the data was performed in Microsoft Excel (version 2016; Microsoft Corp, Redmond, WA), IBM SPSS version 27 (IBM Corp., Armonk, N.Y.) and Stata Statistical Software version 13 (Stata Corp., College Station, TX). Age group was categorised as adult (≥ 18 years) or youth (< 18 years). Descriptive statistics were calculated including mean \pm standard deviation (SD), median \pm interquartile range (IQR) and proportions. Two claims (0.02% of claims) featured incomplete data. One claim did not contain injury location and one claim was missing the injured party's age group. As a result, the relevant claim was excluded from the analysis of its missing variable but included in all other analyses.

The total and annual frequency of injury claims, cost of the injury fund, and specific treatment expenses were calculated for the overall sample, and for adult and youth age groups. Adjusted costs for inflation were also calculated for each individual year and reported in 2020 euro values. The Irish Consumer Price Index,⁹ which is Ireland's official inflation measure was used to calculate inflation. Claim rate calculations were completed for the overall sample (per 1000 players), per club, per 1000 adults and per 1000 youths. The claim rate per 1000 players was calculated using the following formula, for the whole cohort, as well as adults and youth separately:

$$\text{Claim Rate} = \frac{\text{number of injury claims}}{\text{number of players}} \times 1000$$

The 95% confidence interval (CI) for each claim rate was calculated using the Poisson distribution. Poisson regression was used to examine the trends of total claims per 1000 players, as well as lower extremity, knee, and ACL claim rates between 2012 and 2020. The incidence rate ratio (IRR) and percentage change ($100 \times [\text{IRR} - 1]$) were presented.

3. Results

There were 9348 approved claims, 62.9% in adults ($n = 5881$) and 37.1% in youth ($n = 3466$). The total cost of claims was $\text{€}6,200,557.68$ with a mean annual cost of $\text{€}688,950.85$ (Table 1). On average, 1038.66 ± 114.42 claims were made annually with a mean claim value of $\text{€}663.30 \pm 1387.15$.

The overall claim rate per 1000 players was 12.98 (95% CI 12.72–13.25) (Fig. 1). The claim rate per club was 1.15 (95% CI 1.12–1.17). No statistically significant trends in total claims (IRR = 0.95, percentage change = -4.6% , 95% CI -4.1% to -4.7%) or in lower extremity (IRR = 0.95, percentage change = -4.6% , 95% CI -4.0% to -4.8%), knee (IRR = 0.98, percentage change = -2.1% , 95% CI -1.8% to -2.4%), and ACL (IRR = 0.96, percentage change = -3.8% , 95% CI -2.9% to -4.6%) claims were observed between 2012 and 2020 ($p > 0.05$).

The mean cost per claim increased from $\text{€}501.94 \pm 1117.82$ in 2012 to $\text{€}892.11 \pm 1664.06$ in 2020, an increase of 77.7% (Table 2). When adjusted for inflation, the mean cost per claim increased from $\text{€}519.09 \pm 1156.02$ to $\text{€}892.11 \pm 1664.06$, a 71.9% increase over the 9 years.

Lower extremity injuries made up the majority of claims in Ladies Gaelic football (63.8%) and the majority of costs (83.4% of the Injury Fund's total cost) (Table 3). Over a quarter of all claims were knee injuries with a mean claim value of $\text{€}1698.70 \pm 2122.87$. The mean knee surgery cost was $\text{€}1220.76 \pm 535.70$, followed by hospital bills ($\text{€}2394.56 \pm 1412.41$), imaging ($\text{€}235.32 \pm 53.93$) and healthcare professional (HCP) ($\text{€}2228.47 \pm 229.11$). Knee injuries amounted to 70.0% of the Injury Fund's expenses. ACL injuries specifically comprised 7.8% of claims and accounted for 46.7% of the Injury Fund ($\text{€}2,896,286.56$). The ankle and hamstring were the second and third most frequent body parts injured at 13.1% and 9.3% of all claims, respectively.

Table 1
Frequency, rate, and cost of injury claims in Ladies Gaelic Football, 2012–2020.

Total claims	N	Mean ^a	±SD	Median ^a	±IQR	
Claims	9348	1038.66	±114.42	1001.00	±192.50	
Adult (>18 years)	5881	653.44	±64.53	629.00	±93.00	
Youth (<18 years)	3466	385.11	±55.61	372.00	±96.00	
Total claim rates		Claim rate (95 % CI)				
Claim rate per club			1.15		1.12–1.17	
Claim rate per 1000 players			12.98		12.72–13.25	
Claim rate per 1000 adult players			44.29		43.17–45.44	
Claim rate per 1000 youth players			5.90		5.71–6.10	
		€	Mean ^a	±SD	Median ^a	±IQR
Claim values						
Total claim costs	6,200,557.68	688,950.85	±157,015.26	646,174.13	±269,140.86	
Total cost per claim		663.30	±1387.15	162.00	±214.75	
Claim values by age group						
Total adult claim costs	4,737,785.67	526,420.63	±142,404.76	481,205.46	±237,292.68	
Total cost per adult claim		805.61	±1538.51	180.00	±324.00	
Total youth claim costs	1,462,622.01	162,513.56	±35,441.44	154,375.73	±53,971.74	
Total cost per youth claim		421.99	±1039.79	108.00	±125.00	

N = number of claims, IQR = interquartile range; SD = standard deviation.

^a Per year.

Treatment cost for these injuries was 6.5 % and 2.4 % of the fund. Upper extremity claims made up 15.8 % of claims, with claims for finger, wrist and hand injuries being most common. Claims for injuries to the trunk amounted to 13.3 % of all claims, whilst head, neck and face claims accounted for 7 % of total claims.

Direct treatment from a HCP was a part of most claims (75.7 %), followed by accident and emergency (A&E) department visits (27.2 %), hospital bills (12.8 %), imaging (11.3 %) and surgery (8.4 %). Hospital bills had both the greatest mean cost (€2086.05 ± 1535.75) and the greatest total cost (€2,496,996.42) followed by HCPs and surgery (Table 4). Most loss of wage costs came from adults compared to youth players (€528,051.41 vs €5092.47) and the knee (37.5 %) was the most common structure associated with loss of earnings.

Adults made 7.5 times more claims per 1000 players (claim rate (CR) = 44.29; 95 % CI 43.17–45.44) than youths (CR = 5.90; 95 % CI

5.71–6.10). Many claim types were approximately 10 times greater in adults. For example, the lower extremity claim rate per 1000 adults is 29.89 (95 % CI 28.98–30.84) compared to 3.39 (95 % CI 3.25–3.55) in youths. The same is also true for adult (CR = 12.74; 95 % CI 12.15–12.37) and youth (CR = 1.41; 95 % CI 1.31–1.51) knee claims, ACL claims (CR = 4.19; 95 % CI 3.86–4.56 vs CR = 0.30; 95 % CI 0.26–0.34) and hamstring claims (CR = 4.74; 95 % CI 4.39–5.13 vs CR = 0.40; 95 % CI 0.36–0.46). The average adult claim cost was almost twice the average youth claim cost (€805.61 ± 1538.51 vs €421.99 ± 1039.79).

4. Discussion

This study is the first to present a longitudinal review of injury claims in Ladies Gaelic football and establish the financial cost of injury

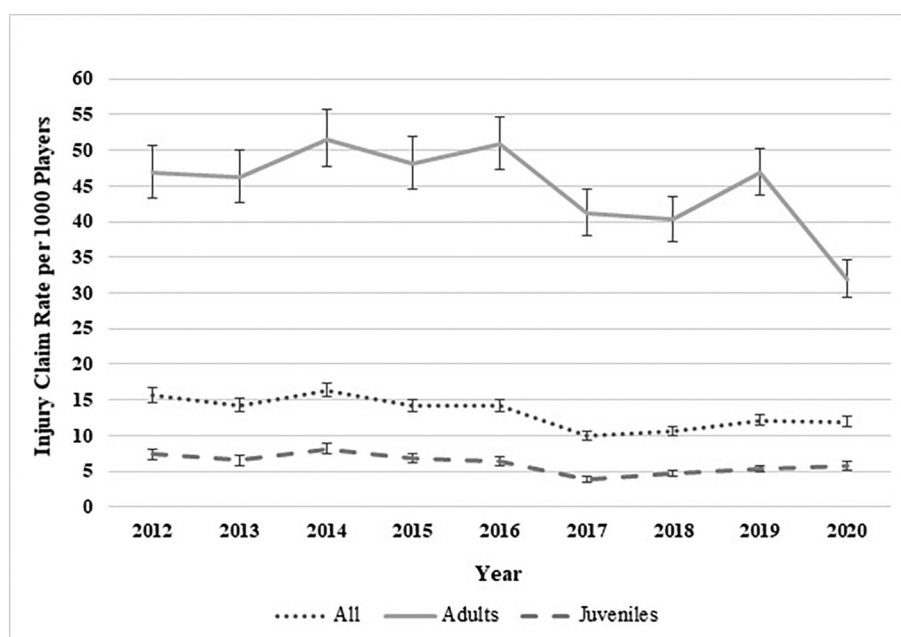


Fig. 1. Injury claim rates per 1000 players (by age group).

Table 2
Annual costs of the Ladies Gaelic Football Association Injury Fund in euro, 2012–2020.

Report year	(N)	Total cost of claims	Total cost of claims (inflation-adjusted)	Cost per claim mean ± SD	Cost per claim (inflation-adjusted) mean ± SD	Cost per claim median ± IQR	Cost per claim (inflation-adjusted) median ± IQR
Total	9348	6,200,557.68	6,318,166.43	663.30 ± 1387.15	675.88 ± 1413.46	162.00 ± 214.75	165.07 ± 218.82
2020	918	818,952.43	818,952.43	892.11 ± 1664.06	892.11 ± 1664.06	201.25 ± 395.00	201.25 ± 395.00
2019	1258	1,019,060.72	1,032,255.73	810.06 ± 1671.79	820.55 ± 1693.44	180.00 ± 263.38	182.33 ± 266.79
2018	996	690,147.04	703,991.51	692.92 ± 1427.64	706.82 ± 1456.28	156.25 ± 225.00	159.38 ± 229.51
2017	888	632,723.96	646,713.84	712.53 ± 1470.21	728.28 ± 1502.72	180.00 ± 242.15	183.98 ± 247.50
2016	1172	805,191.81	825,241.41	687.02 ± 1376.99	704.13 ± 1411.28	171.00 ± 233.25	175.26 ± 239.06
2015	1082	646,174.13	662,924.41	597.20 ± 1235.55	612.68 ± 1267.58	153.00 ± 189.25	156.97 ± 194.16
2014	1082	549,202.16	560,088.23	507.58 ± 1116.44	517.64 ± 1138.57	144.00 ± 170.00	146.85 ± 173.37
2013	951	536,660.37	548,384.83	564.31 ± 1203.08	576.64 ± 1229.36	135.00 ± 170.00	137.95 ± 173.71
2012	1001	502,445.06	519,614.04	501.94 ± 1117.82	519.09 ± 1156.02	144.00 ± 156.78	148.92 ± 162.14

N = number of claims, IQR = interquartile range, SD = standard deviation.

claims in this sport. By gaining a greater understanding of the injury profile and financial burden of injury in Ladies Gaelic football, more relevant and effective injury prevention techniques can be employed. The costs paid out by the Injury Fund between 2012 and 2020 totalled €6.2 million. Comparatively, injury claims in Men's Gaelic football over 8 years saw a higher total cost of approximately €50m,⁷ likely due to the greater playing population of the men's game with men's Gaelic games having a 2.5 times greater claim rate per club than Ladies Gaelic football.⁷ In addition, disparities between the sports, including the amount of physicality acceptable (e.g. a shoulder-to-shoulder charge is permitted in men's Gaelic football but not in Ladies Gaelic football) and game speed could also explain the differences in injury rates, severity and consequential total cost related to injury. This larger frequency and cost burden is similar to findings in soccer¹⁰ and rugby¹¹ where it

is reported that men make approximately 20–40 % more claims than women players. Anatomical, hormonal, and neuromuscular differences between genders are believed to be responsible for differences in injury found between genders.¹² Socio-cultural factors may also play a role, whereby the training, competition and treatment environment in women's sports may all impact injury rate, engagement in injury treatment and consequential submission of injury claims.¹³ For example, women may have less access to medical care and less time to engage with rehabilitation due to inequities outside of sport which may also reduce the injury claim rate.¹³

In Ladies Gaelic football, 12.98 claims per 1000 players were observed, significantly less than what has been shown in women soccer in Belgium (52 claims per 1000),¹⁰ and women rugby union in New Zealand (169 claims per 1000).¹¹ This may be due to differences in

Table 3
Claim frequency and costs per body part injured in Ladies Gaelic football, 2012–2020 (presented by body region and in descending order of total claim value).

Region	% of claims (N)	Total claim value (€)	% of total claim value	Mean cost ± SD (€)	Median cost ± IQR (€)
Total	100.0 (9347)	6,200,557.68	100.0	663.30 ± 1387.15	162.00 ± 214.75
Lower extremity	63.8 (5965)	5,173,088.37	83.4	867.24 ± 1618.26	189.00 ± 327.45
Knee	26.9 (2518)	4,277,324.71	70.0	1698.70 ± 2122.87	405.36 ± 3293.52
Ankle	13.1 (1226)	405,338.16	6.5	330.62 ± 751.27	162.00 ± 152.04
Hamstring	9.3 (867)	148,818.37	2.4	171.65 ± 270.72	144.00 ± 112.50
Leg	5.2 (484)	98,780.16	1.6	204.09 ± 343.58	135.00 ± 126.00
Hip	2.4 (223)	85,675.92	1.4	384.20 ± 919.89	162.00 ± 175.50
Foot	1.9 (182)	84,016.27	1.4	461.63 ± 1092.79	173.00 ± 193.00
Groin	1.4 (132)	24,029.86	0.4	182.04 ± 140.43	160.00 ± 141.75
Quad	1.9 (175)	21,241.87	0.3	121.38 ± 68.23	108.00 ± 99.00
Calf	1.2 (108)	14,606.28	0.2	135.24 ± 90.72	108.00 ± 108.00
Toe	0.3 (24)	6185.13	0.1	257.71 ± 399.06	100.00 ± 106.88
Pelvis	0.0 (<5)	3190.68	0.1	1595.34 ± 1950.68	1595.34
Heel	0.1 (<5)	1423.96	0.0	284.79 ± 173.06	296.96 ± 341.50
Thigh	0.1 (11)	1341.00	0.0	121.91 ± 101.68	90.00 ± 126.00
Shin	0.1 (8)	1116.00	0.0	139.50 ± 106.92	112.50 ± 150.75
Upper extremity	15.8 (1478)	312,853.56	5.1	211.67 ± 472.38	100.00 ± 21.67
Finger	6.7 (625)	103,322.23	1.7	165.32 ± 320.54	100.00
Wrist	3.6 (340)	92,898.81	1.5	273.23 ± 559.93	100.00 ± 45.00
Hand	2.1 (199)	47,924.15	0.8	240.82 ± 699.39	100.00
Arm	1.2 (113)	26,521.07	0.4	234.70 ± 503.69	100.00 ± 75.00
Thumb	1.3 (120)	21,918.45	0.4	182.65 ± 264.44	100.00
Elbow	0.9 (81)	20,268.85	0.3	250.23 ± 530.45	100.00 ± 67.25
Trunk	13.3 (1247)	450,931.93	7.3	361.61 ± 882.50	153.00 ± 164.00
Shoulder	5.6 (524)	260,631.55	4.2	497.39 ± 1160.27	154.50 ± 170.00
Back	6.6 (613)	151,778.58	2.5	247.60 ± 518.89	162.00 ± 169.50
Collar bone	0.5 (44)	30,563.30	0.5	694.62 ± 1320.40	125.00 ± 344.00
Rib	0.7 (66)	7958.50	0.1	120.58 ± 57.99	100.00 ± 50.00
Head/neck/face	7.0 (657)	263,583.82	4.3	401.19 ± 739.40	100.00 ± 200.00
Dental	2.0 (184)	179,815.38	2.9	977.26 ± 1124.49	540.00 ± 1300.00
Head	2.8 (260)	36,830.80	0.6	141.66 ± 187.38	100.00 ± 40.00
Nose	0.8 (77)	18,981.58	0.3	246.51 ± 410.58	100.00 ± 75.00
Neck	0.9 (85)	15,959.06	0.3	187.75 ± 307.25	100.00 ± 116.00
Eye	0.2 (21)	3862.00	0.1	183.90 ± 236.80	100.00 ± 78.50
Facial	0.1 (12)	3565.00	0.1	297.08 ± 583.41	100.00 ± 77.50
Jaw	0.0 (<5)	2875.00	0.1	1437.50 ± 1891.51	1437.50
Mouth	0.1 (14)	1495.00	0.0	106.79 ± 37.60	100.00 ± 18.75
Ear	0.0 (<5)	200.00	0.0	100.00	100.00

N = number of claims, SD = standard deviation, IQR = interquartile range.

Table 4

Cost by items claimed from the Ladies Gaelic Football Association Injury Fund, 2012–2020 (ordered by frequency of claims).

Claim	N	Sum (€)	Mean	±SD (€)	Median	±IQR (€)
Total	9348	6,200,557.68	663.30	±1387.15	162.00	±214.75
Healthcare professional	7076	1,699,396.39	240.16	±304.76	162.00	±171.00
A&E	2544	264,062.34	103.80	±110.02	100.00	±0
Hospital	1197	2,496,996.42	2086.05	±1535.75	2350.00	±3250.00
Imaging	1056	251,774.79	238.42	±56.79	240.00	±95.00
Surgery	793	953,993.11	1203.02	±562.83	1300.00	±550.00
Loss of wages	429	533,143.88	1242.76	±1084.81	874.27	±1400.00
Orthotics	5	1412.26	282.45	±141.89	290.00	±233.13

Note: Healthcare professionals = Athletic therapist/physiotherapist, G.P., consultant, anaesthetic consultant, dentist. Imaging = MRI, X-ray, CT scan. N = number of claims, SD = standard deviation, IQR = interquartile range.

claim databases and eligibility. A lack of access to medical support and tight scheduling in Belgian women's soccer are thought to be responsible for their high injury claim rate,¹⁰ and in rugby union, high injury rates relative to other contact sports are thought to be due to the greater extent of contact allowed.¹⁴

No statistically significant increases or decreases in injury trends between 2012 and 2020 were observed for total claims, lower extremity, knee, or ACL claims. Unfortunately, no trend data over time was available in other Gaelic games for comparison. Despite injury prevention programmes being developed for Gaelic games, and their effectiveness in research being demonstrated,¹⁵ the uptake and long-term utilisation of these programmes is not yet established and adherence may not be high. In another Gaelic sport played by women in Ireland, Camogie, previous research reported only 34 % of coaches used injury prevention programmes and more than half of coaches believe that they lack the knowledge/skills to implement programmes.¹⁶ This may also be apparent in Ladies Gaelic football coaches and players; thus, future research should identify their awareness and use of injury prevention programmes.

The overall injury profile reported in this study is similar to the claim data previously published for Ladies and men's Gaelic footballers.^{2,7} In Ladies Gaelic football, lower extremity injuries make up 63.8 % of injury claims and 83.4 % of total costs. The knee, hamstring, and ankle account for half of all claims, which is similar to previous research in Ladies (44.5 %),¹ and men's Gaelic football (49.8 %).⁷ These structures are associated with a significant injury burden,¹⁷ and possess a high risk of re-injury,^{18,19} meaning that they can greatly impact player availability over the long-term. Thus, preventing lower extremity injuries should be a priority in injury prevention strategies going forward. Prospective injury surveillance that incorporates injury age, mechanism and location of injury occurrence is required for the development of appropriate injury prevention strategies. Additionally, to ensure an injury prevention strategy is successful it is critical that injury surveillance continues as this allows for the efficacy of interventions to be determined.²⁰

The mean cost per claim in Ladies Gaelic football (€663.30 ± 1387.15) was lower than in men's Gaelic games (€1158.40 ± 192.81),⁷ but marginally greater than the average claim in Ladies rugby union in New Zealand (~€420 ± 29).²¹ Differences between injury schemes in terms of maximum entitlement values and eligibility criteria may explain the differences seen in costs between schemes. Between 2012 and 2020, the mean inflation-adjusted claim cost in Ladies Gaelic football increased by 71.9 %. In men's Gaelic football, between 2007 and 2014, an increase in claim cost was also shown, albeit just 7.1 %.⁷ Increased awareness among Ladies Gaelic footballers of the extent of coverage offered by the Injury Fund (i.e., medical expenses up to €5500 and wage reimbursement up to €4000) may be partly responsible for the increase in mean cost found.

No previous research in Gaelic games has detailed the breakdown of treatment costs. The majority of claims in the current study involved visiting a HCP directly, but due to the relatively low cost of these treatments they only amounted to 27.4 % of total costs. Hospital stays and

surgery were infrequent, but considerably more expensive than other treatments, making up 40.3 % and 15.4 % of total costs, respectively. Knee injuries accounted for almost four in five hospitalisations, with over half of these following an ACL strain. In addition, 87 % and 66 % of hospitalisation costs resulted from the knee and ACL, respectively. Preventing knee injuries, ACL injuries in particular, needs to be prioritised as this has the potential to dramatically reduce hospitalisations and their associated cost to the Injury Fund. Decreasing hospitalisations and the need for surgery would also have a positive impact on the performance and quality of life of Ladies Gaelic footballers.²² Nearly two-thirds of those that undergo ACL surgery drop-out from sport within 7 years,²³ and some experience chronic knee pain and osteoarthritis.²⁴ Additionally, drop-out and chronic pain could have a significant lasting impact, as those who participate in organised sport are almost 15 times more likely to meet recommended physical activity levels than those who do not.²⁵ Meeting physical activity guidelines is important as it has been found to reduce mortality risk by approximately 30 %.²⁶ Thus, there is a need to design, implement and endorse an effective injury prevention strategy suitable for all levels and ages that will reduce the risk of suffering all lower extremity injuries, particularly knee and ACL injuries. By doing so, the LGFA could significantly improve the lives of its players and develop lasting sports participation.

Adult Ladies Gaelic football players submitted 7.5 times more claims than youth players, similar to what has been shown in women's rugby union (6.1 times).¹¹ Youth claims were found to make up a greater proportion of total claims (37.1 %) in Ladies Gaelic football when compared with men's Gaelic games (14.7 %),⁷ which could be due to a greater proportion of Ladies Gaelic footballers being at the youth level. From a cost standpoint, adult claims accounted for 76.4 % of the Injury Fund's total cost and adults had nearly 3 times more hospital stays and surgeries than youth players. As expected, wage reimbursement cost was 100 times greater for adults than youths, however, if this is excluded, adult claims still cost almost 3 times that of youth claims. Differences in claim rates between age groups may be due to older age,²⁷ greater playing demands and intensity in adult games,⁷ and a greater likelihood of previous injury which is associated with future injury.²⁸ Whilst knee and ACL claim rates were higher in adults than in youth players, it is important to consider that youth players in this study were inclusive of all registered players younger than 18 years (i.e. from 4 to 17 years). Therefore, as ACL injuries are more frequent in adolescents than in younger players,²⁹ it is essential that future research examines adolescent specific knee and ACL injury rates. The design and implementation of any proposed injury prevention strategy should involve engagement with administrators and end-users (coaches and players), and consider the context-specific issues (e.g., time constraints, workloads, and preferred communication methods) of both adults and youths at all levels of the game to maximise its chances of success.

5. Limitations

Despite being the first study to perform a long-term analysis of injury in Ladies Gaelic football and investigate the financial implications of injury in the sport, this study also had several limitations. Due to the nature of injury claim databases, injuries which are more severe or expensive are more likely to be reported, whereas mild injuries may go unreported which causes a misrepresentation of injury prevalence.³⁰ Additionally, claims are only made to the LGFA Injury Fund after the injured party has made a claim with their insurer, if a member has private insurance, therefore, the true number of injuries and cost to society is higher than presented here. A national injury surveillance system, that can prospectively track injuries in Ladies Gaelic football over time is required. Unfortunately, we had no way of differentiating between new and recurrent injuries, event at the time of injury (training vs game), injury severity or injury mechanism as this information is not collected by the Injury Fund. The Injury Fund should be adapted to collect this information in the future and these factors should be examined in future longitudinal prospective epidemiological studies in this sport. The generalisability of

these findings to other women's community sports is unknown. Cost data was adjusted for inflation using Ireland's Consumer Price Index. Whilst this is the official measure of inflation in Ireland, it is a general inflation measure. Unfortunately, no healthcare pricing index is available in Ireland to utilise. The COVID-19 pandemic may have impacted the findings from 2020 in this analysis. All sport, including Ladies Gaelic football, was stopped for a period of time that year which may have impacted the injury rate and costs reported in 2020. However, claims are only included once treatment is completed and all documentation is submitted by the player. Thus, not all claims in the 2020 Injury Fund report, will have occurred in 2020. Fewer claims from 2020 were observed in the 2020 report than typical. Further analysis on the impact lockdowns had on injury rates, profile and costs associated should be completed in the future.

6. Conclusion

In conclusion, our review of the claim rates per 1000 players, adults, youths and per club in Ladies Gaelic football indicates that injuries have remained consistent over the past 9 years. Injuries to the lower extremity have dominated, with injuries to the knee, ankle and hamstring being consistently frequent. Knee injuries in particular are responsible for more than a quarter of all claims and 70 % of costs. Approximately one in twelve claims in Ladies Gaelic football involve the ACL, and the impact of ACL injury on participation and its high financial burden highlight the importance of preventing this injury in Ladies Gaelic footballers. Future research should be conducted that prospectively tracks injury in Ladies Gaelic football longitudinally. In addition, designing and implementing an injury prevention strategy to reduce lower extremity injuries is a high priority to the LGFA. This strategy should incorporate an injury prevention programme but also detail how to maximise widespread implementation and uptake from all stakeholders of the game (players, coaches, administrators).

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

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Confirmation of ethical compliance

This study was approved by the Dublin City University Research Ethics Committee.

Data availability

No data are available.

Declaration of interest statement

The authors report no competing interests.

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