

1 **Supplementary Information**

2 **Multivariable model**

3 The underlying multivariable model for this study was built using a bespoke MATLAB 2017b code.
4 Univariable logistic regression for each potential risk factor was performed first with a selection criteria
5 of $p < 0.2$ deciding candidates for inclusion in the multivariable model. The remaining risk factors were
6 then progressed into a stepwise backwards-removing multivariable model with each step assessed
7 using the Bayesian Information Criterion. The potential risk factors included are shown in Table 1
8 below.

Potential risk factor	Explanation
Year	Year of competition
Region Group	Region Group in which competition took place
Ride Distance	Distance of ride in km
Field Size	Number of horses that started the ride
Average WBGT Index	Wet-bulb globe temperature index – a climate/weather measure taking into account heat and humidity among other factors
Horse sex	Categories were gelding, mare, stallion, and male unknown
Horse age	Age in years on the date of competition
Horse last result	Outcome of a horse's previous ride
Previous ride distance	Distance covered by horse in previous ride
Days over MRP since last ride	Number of days longer than the mandatory rest period since the horse's previous ride
Horse number of previous FTQ LAs	Number of failure to qualify due to lameness outcomes in the horse's individual history
Horse number of previous FTQ MEs	Number of failure to qualify due to metabolic problems outcomes in the horse's individual history
Horse experience of long rides	Binary category describing if horse had ridden in endurance rides of 120km or further in its past competition experience
Rider age	Age in years on date of competition
Rider sex	Binary category
Returning rider	Binary category – riders were either "first time" or "returning"
Rider last result	Outcome of the rider's previous ride
Rider number of previous FTQ LAs	Number of FTQ LA outcomes in the rider's individual history
Rider number of previous FTQ MEs	Number of FTQ ME outcomes in the rider's individual history
Returning combination	Binary category – specific combinations of horse and rider were either "first time" or "returning"

combination last result	Outcome of the specific combination of horse and rider's previous ride

Table 1: explanation of potential risk factors included in the building of the multivariable model

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11 The results of the full multivariable model for failure to qualify due to lameness (FTQ LA) outcomes
12 are shown in Table 2. Only risk factors with a p-value of less than 0.05 are included. Some factors
13 with $p > 0.05$ were retained in the final model as their omission did not significantly improve the overall
14 fit of the model. Reference categories are denoted by an asterisk.

Risk factor	cases (%)	controls (%)	Odds Ratio (OR)	95% confidence interval	p-value
Year					
Year 2010	1665 (27.7%)	4350 (72.3%)	1.04	0.97 - 1.11	0.267
Year 2011	2757 (26.2%)	7751 (73.8%)	0.98	0.92 - 1.03	0.395
Year 2012	2783 (24.7%)	8480 (75.3%)	0.89	0.84 - 0.94	< 0.001
Year 2013	2580 (24.8%)	7836 (75.2%)	0.9	0.86 - 0.95	< 0.001
Year 2014	2351 (23.3%)	7755 (76.7%)	0.83	0.79 - 0.88	< 0.001
Year 2017*	3279 (26.6%)	9063 (73.4%)	1	-	-
Region Group					
group I*	7272 (25.6%)	21154 (74.4%)	1	-	-
group II	1841 (27.7%)	4807 (72.3%)	1.09	1.03 - 1.16	0.003
group III	177 (22.5%)	610 (77.5%)	0.85	0.72 - 1.01	0.068
group IV	741 (22.8%)	2511 (77.2%)	0.85	0.78 - 0.93	< 0.001

group VII	6416 (27.3%)	17118 (72.7%)	1.01	0.97 - 1.06	0.555
group VIII	747 (21.9%)	2661 (78.1%)	0.87	0.8 - 0.95	0.001
group IX	609 (18.4%)	2701 (81.6%)	0.7	0.63 - 0.76	< 0.001
Ride Distance					
80km*	3700 (20%)	14799 (80%)	1	-	-
90km	1019 (20.9%)	3862 (79.1%)	0.78	0.72 - 0.84	< 0.001
120km	10965 (26.9%)	29821 (73.1%)	1.09	1.06 - 1.13	< 0.001
Field Size					
Field 41 - 60*	2875 (27.4%)	7629 (72.6%)	1	-	-
Field 61 - 80	1592 (28.2%)	4049 (71.8%)	1.18	1.11 - 1.26	< 0.001
Field > 80	4689 (27.2%)	12560 (72.8%)	1.11	1.05 - 1.16	< 0.001
Average WBGT ¹ Index					
mean WBGT 15 - 18*	2402 (24.9%)	7241 (75.1%)	1	-	-
mean WBGT 18 - 21	2119 (24.2%)	6622 (75.8%)	0.95	0.9 - 1.01	0.098
mean WBGT > 21	2033 (26.8%)	5563 (73.2%)	1.11	1.04 - 1.17	< 0.001
Horse sex					
mare*	7079 (25.4%)	20833 (74.6%)	1	-	-
gelding/male unknown	12580 (25.4%)	36967 (74.6%)	0.99	0.95 - 1.02	0.483
stallion	1320 (28.5%)	3319 (71.5%)	1.14	1.07 - 1.23	< 0.001
Horse last outcome					
Last outcome R ²	12418 (24.6%)	38012 (75.4%)	1	-	-
last outcome FTQ ³	6733 (28.3%)	17100 (71.7%)	1.18	1.07 - 1.29	< 0.001
last outcome LA ⁴	4927 (30.1%)	11456 (69.9%)	1	0.91 - 1.1	0.985

¹ WBGT – Wet-bulb globe temperature

² R – Result

³ FTQ – Failure to qualify

⁴ LA – FTQ due to lameness

last outcome ME ⁵	1047 (22.1%)	3696 (77.9%)	0.74	0.66 - 0.84	< 0.001
rider last outcome					
rider last outcome R*	11522 (24.9%)	34837 (75.1%)	1	-	-
rider last outcome other	1867 (24.4%)	5776 (75.6%)	0.95	0.9 - 1.01	0.076
rider last outcome FTQ	6760 (27.7%)	17617 (72.3%)	1.08	1.04 - 1.12	< 0.001
Previous ride distance					
last 80km*	6760 (25.1%)	20162 (74.9%)	1	-	-
last 90km	2116 (26.3%)	5928 (73.7%)	1.12	1.06 - 1.18	< 0.001
Days over MRP⁶ since last ride					
< 1 days	1216 (33.6%)	2401 (66.4%)	1.47	1.36 - 1.58	< 0.001
1 - 2 days	751 (32.6%)	1550 (67.4%)	1.47	1.34 - 1.6	< 0.001
3 - 9 days	1377 (30.3%)	3166 (69.7%)	1.35	1.26 - 1.45	< 0.001
10 - 16 days	1351 (29.5%)	3228 (70.5%)	1.32	1.24 - 1.41	< 0.001
17 - 23 days	1203 (29.5%)	2872 (70.5%)	1.34	1.25 - 1.44	< 0.001
24 - 30 days	1049 (28.6%)	2613 (71.4%)	1.26	1.17 - 1.36	< 0.001
> 30 days*	14032 (23.7%)	45289 (76.3%)	1	-	-
Rider number of previous FTQ LAs					
0 rider LAs*	9832 (23.5%)	32060 (76.5%)	1	-	-
1 rider LAs	5986 (26.9%)	16236 (73.1%)	1.12	1.07 - 1.16	< 0.001
2 rider LAs	2505 (28.7%)	6232 (71.3%)	1.21	1.15 - 1.28	< 0.001
3 rider LAs	1049 (31.3%)	2298 (68.7%)	1.35	1.25 - 1.46	< 0.001
4+ rider LAs	779 (35.5%)	1417 (64.5%)	1.63	1.48 - 1.79	< 0.001
Rider number of previous FTQ MEs					

⁵ ME – FTQ due to metabolic problems

⁶ MRP – Mandatory rest period

0 rider MEs*	16933 (25.9%)	48365 (74.1%)	1	-	-
2 rider MEs	493 (23.3%)	1626 (76.7%)	0.84	0.76 - 0.94	0.002

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18 The results of the full multivariable model for failure to qualify due to metabolic problems (FTQ ME)
 19 are shown in Table 3. Only risk factors with a p-value of less than 0.05 are included. Some factors
 20 with $p > 0.05$ were retained in the final model as their omission did not significantly improve the overall
 21 fit of the model. Reference categories are denoted by an asterisk.

Risk factor	cases (%)	controls (%)	OR	CI	p
Year					
Year 2012	814 (7.2%)	10449 (92.8%)	1.1	1.02 - 1.19	0.018
Year 2016	650 (5.7%)	10694 (94.3%)	0.85	0.78 - 0.93	< 0.001
Year 2017*	705 (5.7%)	11637 (94.3%)	1	-	-
Region Group					
group I*	1318 (4.6%)	27108 (95.4%)	1	-	-
group II	326 (4.9%)	6322 (95.1%)	0.87	0.77 - 0.98	0.019
group IX	128 (3.9%)	3182 (96.1%)	0.65	0.54 - 0.78	< 0.001
Ride Distance					
80km*	828 (4.5%)	17671 (95.5%)	1	-	-
90km	215 (4.4%)	4666 (95.6%)	1.12	0.96 - 1.32	0.157
100km	373 (12.9%)	2518 (87.1%)	2.36	2.06 - 2.71	< 0.001
110km	73 (16.8%)	361 (83.2%)	2.85	2.14 - 3.8	< 0.001
120km	2944 (7.2%)	37842 (92.8%)	1.77	1.63 - 1.91	< 0.001
130km	162 (5.1%)	3035 (94.9%)	1.51	1.25 - 1.81	< 0.001
160km	768 (6.8%)	10467 (93.2%)	1.72	1.55 - 1.92	< 0.001
Average WBGT ⁷ Index					
mean WBGT 15 - 18*	597 (6.2%)	9046 (93.8%)	1	-	-
mean WBGT > 21	602 (7.9%)	6994 (92.1%)	1.21	1.11 - 1.33	< 0.001
Horse sex					
mare*	1598 (5.7%)	26314 (94.3%)	1	-	-
gelding/male unknown	3457 (7%)	46090 (93%)	1.1	1.04 - 1.17	0.002
Horse age					
age 8 < 9	826 (5.6%)	13848 (94.4%)	0.95	0.88 - 1.03	0.195
age 9 < 10*	856 (6%)	13306 (94%)	1	-	-
age > 12	1104 (8.5%)	11924 (91.5%)	1.17	1.09 - 1.26	< 0.001
Horse last outcome					

⁷ WBGT – Wet-bulb globe temperature

last outcome R ⁸	3035 (6%)	47395 (94%)	1	-	-
last outcome other	555 (7.1%)	7264 (92.9%)	1.12	1.02 - 1.23	0.023
last outcome LA ⁹	926 (5.7%)	15457 (94.3%)	0.88	0.74 - 1.04	0.124
last outcome ME ¹⁰	672 (14.2%)	4071 (85.8%)	1.32	1.1 - 1.59	0.003
Previous ride distance					
last 80km*	1751 (6.5%)	25171 (93.5%)	1	-	-
last 90km	431 (5.4%)	7613 (94.6%)	0.99	0.88 - 1.1	0.793
last 100km	326 (11%)	2646 (89%)	1.27	1.12 - 1.45	< 0.001
last 110km	55 (13.8%)	345 (86.3%)	1.39	1.01 - 1.9	0.042
last 130km	109 (3.8%)	2766 (96.2%)	0.61	0.5 - 0.75	< 0.001
Days over MRP since last ride					
1 - 2 days	205 (8.9%)	2096 (91.1%)	1.07	0.92 - 1.25	0.354
3 - 9 days	366 (8.1%)	4177 (91.9%)	1.09	0.97 - 1.22	0.155
> 30 days*	3662 (6.2%)	55659 (93.8%)	1	-	-
Horse number of previous FTQ MEs					
0 horse MEs*	2781 (5.6%)	46989 (94.4%)	1	-	-
2 horse MEs	600 (8.1%)	6812 (91.9%)	1.08	0.98 - 1.18	0.118
3 horse MEs	310 (9%)	3142 (91%)	1.16	1.02 - 1.31	0.022
4+ horse MEs	471 (9.4%)	4514 (90.6%)	1.1	0.99 - 1.22	0.073
Rider sex					
Female Rider*	1461 (4.3%)	32755 (95.7%)	1	-	-
Male Rider	3908 (8.2%)	43974 (91.8%)	1.73	1.62 - 1.85	< 0.001
Rider age					
age 24 < 30*	1061 (6.7%)	14868 (93.3%)	1	-	-
age > 41	893 (5.5%)	15219 (94.5%)	0.86	0.79 - 0.92	< 0.001
Rider number of previous FTQ MEs					
0 rider MEs*	3552 (5.4%)	61746 (94.6%)	1	-	-
1 rider MEs	1084 (10.7%)	9031 (89.3%)	1.62	1.49 - 1.76	< 0.001
2 rider MEs	335 (15.8%)	1784 (84.2%)	2.2	1.92 - 2.52	< 0.001
3 rider MEs	103 (17%)	502 (83%)	2.1	1.68 - 2.64	< 0.001
4+ rider MEs	67 (26.1%)	190 (73.9%)	3.28	2.44 - 4.41	< 0.001

⁸ R - Result

⁹ LA – Failure to qualify due to lameness

¹⁰ ME - Failure to qualify due to metabolic problems