

Career profile and pattern of racing for Thoroughbred jumps-racing horses in New Zealand

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ABSTRACT

Context. Racing structure and focus for racehorses differs across jurisdictions and is poorly described. In New Zealand and Australia, jumps racing accounts for a small proportion of total Thoroughbred races each year, as opposed to the larger jumps-racing (National Hunt) industry with purpose-bred horses found in the UK and Ireland. **Aims.** This study aimed to describe the career profile and pattern of racing for Thoroughbred jumps-racing horses in New Zealand. **Methods.** Metrics from every horse with a full jumps-racing career ($n = 1276$, 89% geldings) between the 2005/06 and 2021/22 racing seasons ($n = 40,302$ starts) were examined. Descriptive statistics, box plots and heat maps were used to describe the data, by using horse age as a proxy for career progression. **Key results.** Jumps-racing horses had a median of 17 flat starts (IQR 9–30) before their first jumps-racing start. The median career of a jumps-racing horse was 3.7 years (IQR 2.3–5.2) and 29 starts (IQR 16–44). Older horses had a decreasing number of flat-racing starts and an increasing proportion of steeplechase-racing starts. However, the majority of horses still had at least one flat-race start per calendar year, often prior to the first jumps race. Most horses had one spell each season (length 194 days, IQR 124–259), and a condensed preparation length over the winter months, with a median of 14 days (IQR 10–21) between starts. **Conclusion.** The career pattern for jumps-racing horses in New Zealand reflects the industry retention of horses with a prior career in flat racing into a secondary jumps-racing career. Successful horses have increased focus on preparation for the winter jumps-racing season. **Implications.** Jumps racing provides a secondary career for some flat-racing horses, particularly geldings. This strategy reduces wastage of horses from the industry.

Keywords: hurdle, jumps racing, periodicity, secondary career, steeplechase, sustainability, Thoroughbred racing, wastage.

Introduction

In New Zealand, the Thoroughbred racing industry is divided into flat racing and jumps racing. Jumps races are run over a longer distance than flat races and include obstacles, either hurdles or steeplechase jumps (Bolwell *et al.* 2014). The median race distance in New Zealand for a flat race is 1400 m (Bolwell *et al.* 2014), whereas the median race distance for a hurdle or steeplechase race is 3000 m and 4000 m respectively (Gibson *et al.* 2023b). Hurdle races have a minimum of eight removable padded fences that are 1.2 m high, whereas steeplechase races have a minimum of 10 permanent or removable timber and brush fences with a height of 1.2–1.5 m (NZTR 2019). Although the official Thoroughbred racing season is from 1 August to 31 July, the jumps-racing season runs during the wetter months of late autumn to early spring (April–September). These wetter months generally provide softer ground conditions, which are reported to be a reduced risk factor for horse falls and injuries (Legg *et al.* 2020; Gibson *et al.* 2022). Most races in New Zealand are handicap races (including maidens) where horses with a greater merit are assigned higher weights. Horses are assigned a rating for each race type they participate in, which is calculated on the basis of their performance in that race type and is recalculated within 2 days of their most recent start.

Jumps racing makes up 3% of all Thoroughbred racing starts in New Zealand (Legg *et al.* 2020), 0.3% of all racing starts in Australia (Flash *et al.* 2023) and 38% of all racing starts in Great Britain (Balendra *et al.* 2008). The difference in the proportion of jumps-racing starts reflects differences in the racing structure and focus between jurisdictions. In the southern hemisphere, jumps-racing horses are commonly recruited from a pool of flat-racing horses that are often too slow to be competitive to continue a flat-racing career. In contrast, jumps-racing horses in the northern hemisphere (i.e. Great Britain and Ireland) are typically bred specifically for the purpose of jumps racing (National Hunt) (Ruse *et al.* 2015).

Jumps racing typically has a higher risk of horse injury and fatality than has flat racing because of longer race distances and the inclusion of obstacles (Parkin *et al.* 2004b; Boden *et al.* 2006; Gibson *et al.* 2023b). Increasing race distance and the inclusion of obstacles in jumps racing increases the exposure time for injury and fatality, as well as the likelihood of fatigue-related accidents such as horse falls (Gibson *et al.* 2022; Legg *et al.* 2022).

In New Zealand, horses have to be a minimum of 3.5 years old to start in a hurdle race and 4 years old to start in a steeplechase race (NZTR 2023). Because of these minimum age requirements, jumps-racing horses are typically older than horses racing in flat races, which has been suggested as an additional risk factor for their higher injury and fatality rates (Bailey *et al.* 1998; Ruse *et al.* 2015; Hitchens *et al.* 2019; NZTR 2023). The limbs, and joints in the distal limb in particular, of New Zealand jumps-racing horses may have accumulated more load cycles and microdamage than those of jumps-racing horses in other jurisdictions as a result of having a previous flat-racing career prior to starting their jumps-racing career. However, the incidence of musculoskeletal injuries in New Zealand jumps racing is similar to that in other racing jurisdictions (Gibson *et al.* 2023b). A contributing factor to this may be the effect of early exercise in racehorses improving musculoskeletal adaptation to future loading, consequently reducing subsequent risk of musculoskeletal injury (Parkin *et al.* 2004a; Rogers *et al.* 2012). In other jurisdictions, horses that are bred for jumps racing are often brought into training at an older age, missing the essential developmental window to prime the musculoskeletal system for the future loading during racing (Ely *et al.* 2009).

There are differences in jurisdiction structure and focus of racing that determine the training, racing career profile and pattern. Subsequently, this can have an influence on the risks of falls and injury. Therefore, descriptive statistics to characterise the pattern of racing specific to New Zealand jumps racing can be valuable to industry management and horse welfare. Although Australia has a similar method for sourcing horses into jumps racing, direct comparisons are difficult, because of the restriction of jumps racing to only two states (Ruse *et al.* 2015). The population of Thoroughbreds partaking in both flat and jumps racing in the 2005–2011

New Zealand racing seasons has been previously described in Bolwell *et al.* (2014). However, the Bolwell *et al.* (2014) study was simply descriptive and did not describe the career of the jumps-racing horse or the pattern of jumps racing. Career profiles and the pattern of racing for jumps-racing horses is necessary to provide baseline data for future longitudinal studies examining the impact of the pattern of racing on injury risk. Therefore, the aim of this study was to describe the career profile and pattern of racing of Thoroughbreds participating in jumps racing in New Zealand.

Materials and methods

Data acquisition

Data for all flat and jumps-racing starts for the 2005/06–2021/22 racing seasons were obtained from New Zealand Thoroughbred Racing (NZTR, the official governing body for racing in New Zealand). These data contained the official race-start records, including horse name, age, race date, race type, flat and jumps rating.

Statistical analyses

A jumps-racing horse was defined as any horse that had at least one start in either a hurdle or steeplechase race during its racing career. All analyses were restricted to jump racing horses who had a complete racing career between the years 2005/06 and 2021/22. A complete race career was defined as any horse that did not have a race start in the 2005/06 and/or 2021/22 race seasons, indicating that their first and last races (complete career) were within the 2005/06 and 2021/22 racing periods. A hurdle career was defined as a horse career that had more than one or more starts in a hurdle race and no steeplechase starts. Horses with one or more steeplechase starts were defined as having a steeplechase career.

Normality of data was tested using an Anderson–Darling test. Descriptive statistics (median and interquartile range [IQR]) were used to describe the data at race and start level, with differences between race types examined using a Kruskal–Wallis test for non-parametric data.

The number of days between races and spell length were calculated for each horse by calculating the number of days between consecutive race dates. A racing preparation was defined as fewer than 60 days between two consecutive racing starts for a horse. If the interval between races for a horse was equal to or greater than 60 days, the horse was considered to have had a rest period from active training ('spell').

Data were examined by calendar year (and age of horse at the beginning of the calendar year), rather than racing season (Fig. 1). The New Zealand jumps-racing season (April–October) overlaps two consecutive racing seasons (1 August–31 July). Therefore, by analysing the data using calendar year (1st of January–31st of December), an entire jumps-racing season

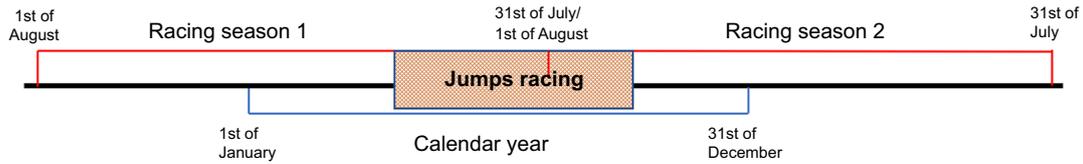


Fig. 1. Diagram showing the timing measures of ‘calendar year’ (blue line) and ‘racing season’ (red line), with the period of jumps racing being highlighted.

was encapsulated. Conversely, spell length was calculated by racing season, as horses were unlikely to have a long spell during the short jumps-racing season.

All statistical analyses were conducted using RStudio (version 3.5.1, 2018; R Foundation for Statistical Computing, Vienna, Austria) with a level of significance set at $P < 0.05$.

Results

During the 2005/06–2021/22 race seasons, 1276 horses had a complete race career, including at least one jumps race. This cohort was made up of mainly geldings ($n = 1120$, 87.8%), followed by mares ($n = 152$, 11.9%) and stallions ($n = 4$, 3.1%). These horses had 40,302 race starts, of which 31,297 (78%) were flat races, 5644 (14%) were hurdle races and 3361 (8%) were steeplechase races. Geldings accounted for most (89%) of the racing starts (Table 1).

Over half of jumps-racing horses were 2–3 years old at their first flat-race start ($n = 715$, 56.0%), followed by 4–5 years

Table 1. Age and sex distribution of 1276 horses with an entire jumps-racing career between the 2005/06 and 2021/22 Thoroughbred racing seasons in New Zealand.

Age (years)	Number of horses with a start at these ages			Total	Total number of starts			Total
	Colt/ Stallion	Filly/ Mare	Gelding		Colt/ Stallion	Filly/ Mare	Gelding	
2	9	21	115	145	20	29	235	284
3	9	74	630	713	39	399	3231	3669
4	19	118	887	1024	121	873	6699	7693
5	7	126	961	1094	29	1129	7911	9069
6	4	120	844	968	32	858	6563	7453
7	2	82	666	750	8	561	4756	5325
8	1	58	478	537	6	312	3137	3455
9	1	20	298	319	3	110	1773	1886
10	0	9	178	187	0	46	835	881
11	0	3	81	84	0	11	382	393
12	0	2	32	34	0	6	127	133
13	0	1	12	13	0	3	49	52
14	0	0	3	3	0	0	9	9
Total	52	634	5185		258	4337	35,707	40,302

($n = 473$, 37.1%) and 6+ years (88, 6.9%). Only 26 (2.1%) horses did not have a flat race as their first career start (17 hurdle and 9 steeplechase starts). Horses had a median of 17 [IQR 9–30] flat starts prior to their first career jumps start and a median flat rating of 58 [IQR 50–66] before their first jumps-racing start. Most (92%, 1155/1260) horses first start in a jumps race was in a hurdle race, with only a small number of horses (8%, 105/1260) starting their jumps-racing career with a steeplechase race. A hurdle-racing career was the most common jumps career, with 746/1276 (59%) horses competing only in flat and hurdle races and 530/1276 (41%) horses competing in at least one steeplechase start. Steeplechase horses that started their jumps career with a hurdle race competed in a median of four [IQR 2–7] hurdle starts before their first steeplechase start.

Horses started in their first hurdle and steeplechase races at an older age than horses starting in their first flat races ($P < 0.05$, Table 2). The total number of starts a horse had per calendar year was greater for hurdle-racing horses than horses racing in only flat races or steeplechase-racing horses ($P < 0.05$). Steeplechase-racing horses had the least number of flat starts in a calendar year.

The median career length for a jumps-racing horse was 3.7 years (IQR 2.3–5.2) with a median of 29 [IQR 16–44] career starts. Horses participating in a hurdle career had a

Table 2. Median and IQR of age at first and last start, age of starter and number of starts per calendar year by race type (flat, hurdle or steeplechase) for jumps-racing horses during the 2006/07–2020/21 Thoroughbred racing seasons in New Zealand.

Item	Flat	Hurdle	Steeple	Total
Age at first start (years)	3 [2–4]a	5 [5–6]b	6 [5–7]c	–
Age at last start (years)	7 [5–8]a	6 [5–8]b	7 [6–9]c	–
Age of starter (years)	5 [4–6]a	6 [7–8]b	8 [6–9]c	–
Number of starts per flat-racing calendar year	6 [3–10]	–	–	6 [3–10]
Number of starts per hurdle-racing calendar year	5 [3–7]	2 [1–4]	–	8 [5–10]
Number of starts per steeplechase-racing calendar year	2 [1–4]	2 [1–4]	3 [1–5]	7 [5–9]

Different letters in the same row indicate significant ($P < 0.001$) differences among the race types.

shorter career length (3.2 years, IQR 1.9–4.5, $P < 0.05$) than had horses participating in a steeplechase career (4.6 years, IQR 2.9–6.2). Seven horses (0.6%) had only one jumps-racing start in their career, and the maximum number of starts for one horse was 160 (12 years). As a horse age increased, the proportion of steeplechase-racing starts for that age group also increased, with a concurrent decrease in flat-racing starts (Fig. 2).

Each year, jumps-racing horses had a median of one spell [IQR 1–1] with a median spell length of 194 days [124–259] between starts. Within a racing preparation, horses had a median of 14 days (IQR 10–21 days) between races. As horses aged, spell length increased (Table 3), with most of the racing starts occurring just prior to and during the jumps-racing season (Fig. 3). In all, 403 (32%) horses had a spell that was longer than 365 days, of which 46 had two spells longer than 365 days and eight had three spells longer than 365 days. The median spell length exceeding 365 days was 560 days

[428–663]. The median age for a horse to have a spell for longer than 365 days was 5 years [IQR 4–6]. Jumps-racing horses participated in more flat races in April and May (the start of the jumps-racing season). The peak number (2475/5644, 43.9%) of hurdle-racing starts was in June and July, and steeplechase-racing starts (844/3361 starts, 25.1%) in August.

Three-year-old horses had few jumps-racing starts, but competed in flat races year-round (Fig. 3). Five-year-old horses also raced in flat races year-round, in addition to jumps races during the winter months. As horse age increased, the proportion of flat-racing starts decreased, and proportion of jumps-racing starts increased within a year (Figs 3, 4). Most jumps-racing horses competed in flat races at the start of their racing preparation, before switching to either hurdle or steeplechase races for the remainder of their preparation (Fig. 4). Horses typically did not alternate between hurdle and steeplechase races within a season but would often have flat starts between some jumps-race starts.

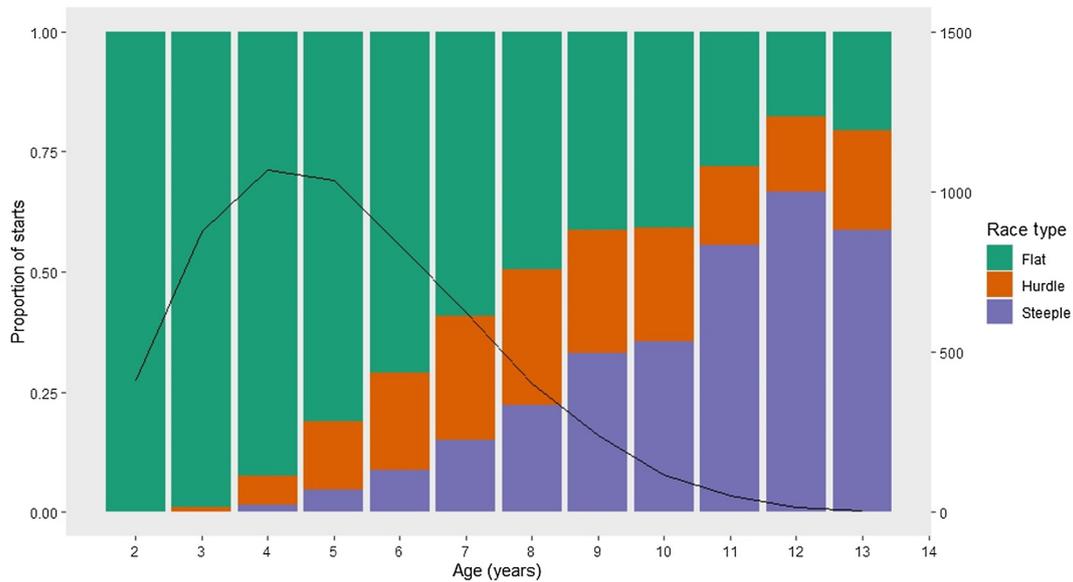


Fig. 2. Proportion of flat-, hurdle- and steeplechase-race starts with respect to horse age (calculated by calendar year) for jumps-racing horses during the 2005/06–2021/22 Thoroughbred racing seasons in New Zealand. Line plot and secondary axis describe the numbers of horses racing.

Table 3. Pattern of racing and all spells (median and IQR) for jumps-racing horses during the 2005/06–2021/22 Thoroughbred racing seasons in New Zealand.

Age (years)	Number of horses	Number of starts	Time between races (days)	Preparation length	Number of preparations	Number of spells	Spell length (days)
3	713	6 [3–9]	15 [10–21]	58 [34–100]	1 [1–2]	1 [1–2]	146 [96–196]
4	1024	8 [5–11]	15 [11–21]	91 [47–140]	1 [1–2]	1 [1–1]	162 [108–238]
5	1094	8 [5–11]	15 [10–21]	105 [59–155]	1 [1–1]	1 [1–1]	182 [117–250]
6	968	8 [4–11]	14 [10–21]	105 [56–152]	1 [1–1]	1 [1–1]	205 [141–266]
7	750	7 [4–10]	14 [10–21]	96 [50–139]	1 [1–1]	1 [1–1]	216 [157–287]
8+	1177	6 [3–8]	14 [10–21]	89 [44–129]	2 [1–3]	2 [1–3]	238 [194–315]

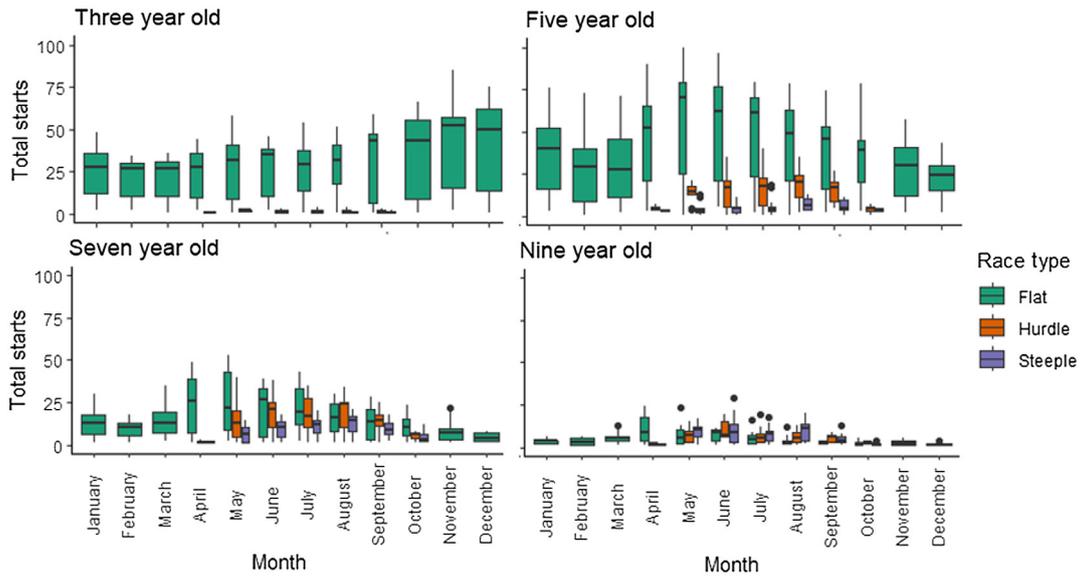


Fig. 3. Total number of flat-, hurdle- and steeplechase-racing starts per month for jumps-racing horses aged 3, 5, 7 and 9 years during the 2005/06–2021/22 Thoroughbred racing seasons in New Zealand.

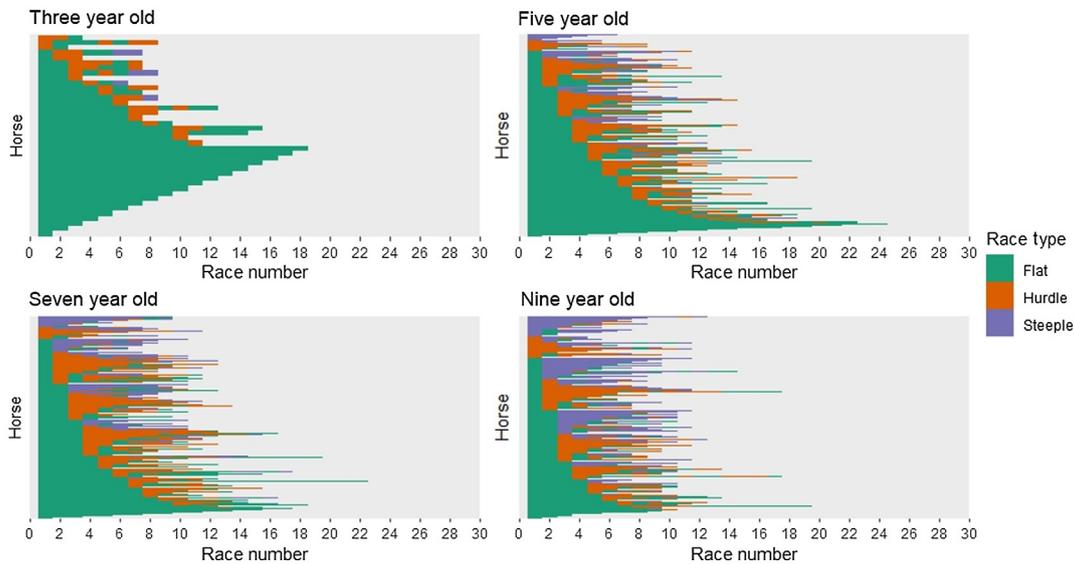


Fig. 4. Heat map describing race number within a calendar year by race type for jumps-racing horses aged 3, 5, 7 and 9 years during the 2005/06–2021/22 Thoroughbred racing seasons in New Zealand.

Discussion

This study has described the career profile and normal pattern of racing for Thoroughbred jumps-racing horses over 15 seasons in New Zealand. Jumps-racing horses were older, predominantly geldings and had more races in their career than did flat-racing horses in New Zealand (Tanner *et al.* 2013). This pattern is similar to overseas jurisdictions such as the UK and Australia where the median age for a horse starting in a jumps race is older than that in flat racing (~6–8 years old) (Pinchbeck *et al.* 2002; Reardon *et al.* 2013;

Ruse *et al.* 2015; Flash *et al.* 2022). In addition, horses starting in hurdle races are typically 1 year younger than those in steeplechase races, likely to be due to most horses starting their jumps-racing careers in hurdle races and progressing onto steeplechase races (Pinchbeck *et al.* 2002; Reardon *et al.* 2013). However, over half (59%) of horses remained in hurdle racing, often because they were better suited to faster race speeds and lower obstacles.

The majority of jumps-racing horses in New Zealand began their jumps-racing careers at 5 years of age after initially racing as flat-racing horses. The proportion of flat racing

undertaken by jumps-racing horses in the current study was much higher than that reported for the UK (Ely *et al.* 2010). This can be due to differences in racing and production focus between the jurisdictions. The primary breeding objective for the Thoroughbred racing industry in New Zealand is to produce flat-racing horses to supply the export market and for domestic racing. In contrast, the UK and Ireland have a higher proportion of National Hunt horses bred specifically for jumps racing (24.9% for Great Britain) (PriceWaterhouseCoopers 2018). As a result, only a small proportion of National Hunt horses compete in flat races (Reardon *et al.* 2013), and the total number of flat races that National Hunt horses participate in is considerably less (10% of starts) (Ely *et al.* 2010) than observed in New Zealand.

In the current study there was a strong bias towards geldings (rather than mares) in the jumps-racing population, in comparison to the more even distribution of sexes observed for flat racing in both New Zealand (50% geldings) and Australia (55% geldings) (Flash *et al.* 2023; Gibson *et al.* 2023a). Mares are more likely to be retired (Velie *et al.* 2013), and at a younger age than geldings owing to their residual value as a broodmare (Perkins *et al.* 2005; Shrestha *et al.* 2021; Chin *et al.* 2022). The typical age for a maiden mare at mating in New Zealand is 5.6 years old (Chin *et al.* 2022), similar to the median age at first jumps-racing start observed in the current study. In contrast, geldings have no residual breeding value and therefore have a greater chance of being retained within the racing population (Legg *et al.* 2021). This export focus for flat-racing horses means New Zealand breeders have no incentive to race mares in jumps racing, because this would not increase their economic worth as a broodmare. In contrast, National Hunt horses are specifically bred for jumps racing, this explains the larger proportion of mares within the jumps-racing population in the UK (22%) than in New Zealand (11.9%) (Allen *et al.* 2007).

Maiden racehorses (horses that have not yet won a race) have a flat-racing rating of 55 or lower. The median rating for horses entering jumps racing was 58, indicating a low performing or inexperienced horse. To prolong their career in the racing industry, geldings that fail to perform in flat racing, can be repurposed for jumps racing. This strategy provides another racing option for some horses within the industry and improves sustainability, in addition to potentially providing owners with another opportunity of recovering some of the costs involved in racehorse production (Bailey *et al.* 1998; Perkins *et al.* 2005). This further provides explanation to the strong bias towards geldings, which is unique to flat racing in New Zealand. The majority of horses at the completion of their flat-racing career do not enter jumps racing but are retrained for other equestrian disciplines (Crawford *et al.* 2021).

Wastage from the racing industry is a large welfare and sustainability concern worldwide, so the option of repurposing underperforming flat-racing horses that are potentially more

suited for jumps racing is advantageous (Ruse *et al.* 2015; Rogers *et al.* 2023).

Three-year-old jumps-racing horses had a similar pattern of racing as did flat-racing horses, with very few horses starting their jumps-racing career in the autumn of their 3-year-old year. As horses aged, they had fewer flat races, with flat starts occurring in the autumn or winter season, as preparation for jumps racing. The lack of race starts by older horses in summer reflects the focus of these horses to race in the jumps races, and that many of these horses are not competitive racing against purely flat-racing horses. Where experienced jumps-racing horses had flat-racing starts, these were likely in high weight races (flat races restricted to jumps-racing horses), just prior to the start of the jumps-racing season in April/May. This also indicated that these flat races were part of the final stage of fitness preparation before competing in jumps races. Older jumps-racing horses are likely to be more experienced, and so generally require fewer flat starts at the beginning of the season to prepare them for jumps races, explaining fewer flat races with an increasing age.

Jumps-racing horses in New Zealand had one race preparation each calendar year, coinciding with the jumps-racing season. As horses aged, and increasingly specialised in their jumps-racing category, there was a concurrent increase in spell length. Jumps-racing horses generally have only one spell during spring/summer, where trainers tend to focus time and resources on younger flat-racing horses that race in higher-stakes races. The median spell length for a jumps-racing horse (194 days) was longer than that reported for flat-racing horses in New Zealand (161 days) (Legg *et al.* 2021). This reflects the relatively condensed length of the jumps-racing season during the winter months compared to flat racing (Ruse *et al.* 2015). A by-product only having one spell and a condensed jumps-racing season was that jumps horses had more races within one preparation with a shorter gap between races than similarly aged flat-racing horses (Legg *et al.* 2021). Given that horses that had a spell greater than 365 days were 5 years old, it is possible that longer spells are given to horses that were unsuccessful in flat racing, to allow them to mature and be eligible to start jumps racing.

Horses entering jumps racing traditionally begin with hurdle races, because these races are shorter, and have lower height jumps than do steeplechase races. The younger age at first start in hurdle versus steeplechase races may be due to the younger age of eligibility to start in hurdle races (minimum 3.5 years old vs 4 years old) (NZTR 2023), reflecting the industry common practice to start jumps horses in hurdles races and progress to steeplechase. This trend is consistently observed worldwide, as National Hunt horses in the UK also begin steeplechase races at an older age than they do hurdle races, despite the eligibility-age criteria being the same (4 years) (Reardon *et al.* 2013). As horses become more experienced in jumps racing, trainers will recognise those that favour a longer race distance and progress horses to specialise

in steeplechase racing, whereas horses that favour a shorter distance can remain in hurdle racing. The proportion of starts of all horses in steeplechase races increased with age and is reflected in the older median starter age. The older age of steeplechase horses than of hurdle- and flat-race horses has been suggested to be a contributing factor to the higher incidence of injuries and fatalities in steeplechase races than hurdle and flat races overseas (Ely *et al.* 2010; Reardon *et al.* 2013). However, in New Zealand, there is little difference in the incidence of race day horse fatality between hurdle and steeplechase races, possibly reflecting jurisdictional differences in risk factors for fatality (Gibson *et al.* 2023b). Reasons for these jurisdictional differences in risk factors may be due to race-level factors such as field size, race distance, jump size and type as well as horse-level factors such as age and career profile.

The structure of racing data provided some limitations. It was not possible to identify jumps horses that raced overseas and returned to New Zealand. However, the export of New Zealand jumps horses is rare and thus unlikely to have affected reliability of this dataset. To identify first starts and end of racing career, the dataset was truncated to 2006/07–2020/21. Approximately 54 horses may have a start in the seasons that were truncated, comprising 4% of the total observations over 15 seasons. Therefore, it is expected that the inclusion of these horses would have minimal effect on the results presented.

Conclusions

The population structure and career pattern of jumps racing in New Zealand reflects the movement of less competitive flat-racing horses into a jump racing career. This process highlights the difference in New Zealand relative to other jurisdictions such as the UK and Ireland. New Zealand does not have a sector of the Thoroughbred breeding industry focusing specifically on breeding jumps-racing horses. Thus, New Zealand jumps-racing horses are more likely to have had flat-racing experience prior to a jumps-racing career. The short-condensed jumps-racing season (only offered during winter) is reflected in a longer spell between racing preparations and greater frequency of racing within a preparation than is observed with flat racing.

Jumps racing provides another racing career for some flat-racing horses, generally geldings. However, in contrast to some northern hemisphere racing jurisdictions, there are limited opportunities for jumps racing in New Zealand, with only 3% of all racing in New Zealand being associated with jumps racing.

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