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## BRIEF COMMUNICATION: Preliminary examination of wastage in Thoroughbred and Standardbred horses in New Zealand using training milestones

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### Introduction

The production of Thoroughbred and Standardbred horses to race is a multi-million dollar industry in New Zealand. However, wastage studies have shown that as many as 50% of foals born fail to race (Wilsher et al. 2006; Jeffcott et al. 1982; Perkins et al. 2004a; Perkins et al. 2004b). Wastage, defined as losses that occur during the production of horses to race, is a major cause for concern in the racing industry and has both animal welfare and economic implications. Wastage may be caused by several factors including lack of ability, physical injury or financial decision by owners and can occur at any stage from conception through to competing at the races.

Horses pass through the various stages from training through to racing by meeting various training milestones. These are easily quantifiable and recognised by the industry. Three training milestones were used in this study. The first is “Registered with a trainer” (REG), which is the official notification to New Zealand Thoroughbred Racing or Harness Racing New Zealand from a trainer that a horse is in training in his/her stable. The second milestone is that a horse is “Entered in a Trial” (TRIAL). Trials are competitive events managed by the New Zealand racing authorities, used to condition horses, assess race potential, and to reveal potential to the wagering public. The third training milestone is “Competing in a race” (RACE) for the first time. For clarity and brevity in this paper, the three milestones are referred to by the abbreviations as shown above. The aim of this study was to investigate the failure of a selected cohort of Thoroughbred and Standardbred horses to reach key industry training milestones.

### Materials and methods

Performance data of all Thoroughbred and Standardbred foals born in the 2001/2002 season were obtained from New Zealand Thoroughbred Racing and Harness Racing New Zealand. Information available included horse identity, breed, brand, sex, sire, dam, exports, imports, last registered trainer, the achievement, or not, of the three industry-recognised training milestones of REG, TRIAL RACE, stratified by age group, number of career and annual trial and race starts, and career and annual earnings. Data were current to the end of the horses’

seven-year-old season. Horses were categorised as male or female only as there were no castration records available. Cross-tabulations of breed and gender with the training milestones were used to examine frequency data. Pearson chi-square tests were used to measure the association of breed with each training milestone for both male and female horses. Logistic regression was used to compare associations of reaching training milestones with breed and gender at a univariate level. Variables showing some univariate association ( $P < 0.5$ ) with the training milestones were analysed in multivariable models with an interaction term of breed x gender added. Data were structured for analysis in Excel and imported into STATA 11 (StataCorp, TX, USA) for analysis.

### Results

There were 7,715 horses in the study population of which 4,683 (2,230 males and 2,453 females) were Thoroughbreds and 3,032 (1,521 males and 1,511 females) were Standardbreds. A total of 32.2% (2,488/7,715) of horses failed to be registered with a trainer, 42.0% (3,244/7,715) failed to trial, and 53.8% (4,149/7,715) failed to race in New Zealand.

Table 1 presents the number of horses that attained or failed to attain the three training milestones of REG, TRIAL and RACE within each breed stratified by gender, and the percentage of loss at each successive milestone. Wastage was calculated as the proportion of horses lost from each successive milestone. Overall a higher percentage of male Thoroughbreds never raced compared to male Standardbreds and a higher proportion of female Standardbreds never raced compared to female Thoroughbreds

Univariable logistic regression identified that female horses were 0.77 (95% confidence interval (95% CI) 0.70–0.85) times less likely to REG ( $P$  to TRIAL ( $P < 0.001$ ), and 0.87 (95% CI 0.80–0.95) times less likely to RACE ( $P = 0.002$ ) than male horses.

Logistic regression on the association of breed with attaining training milestones identified that Standardbreds were 1.13 (95% CI 1.03–1.24) times more likely to TRIAL ( $P = 0.013$ ), and 1.13 (95% CI 1.03–1.24) times more likely to RACE ( $P = 0.009$ ) than Thoroughbreds. There was no statistically significant association of breed with REG.

**Table 1** Number of horses born in the 2001/2002 season by breed and gender that failed to attain or attained, each successive training milestone of being registered with a trainer, and raced. Wastage is calculated as the proportion of horses that having attained the previous milestone did not attain the next milestone. P value in bold indicates significance at  $P < 0.05$ . P value in italics indicates approaching significance at between 0.05 and 0.10.

Gender	Milestone	Achieved milestone	Breed				Chi-square (Wastage between breeds)	P-value (Wastage between breeds)
			Thoroughbred		Standardbred			
			Number of horses	Wastage (%)	Number of horses	Wastage (%)		
Male	Records available		2,230		1,521			
	Registered with a trainer	No	679	30.4	420	27.6	3.51	<i>0.06</i>
		Yes	1,551		1,101			
	Trialled	No	240	15.5	129	11.7	9.94	<b>0.002</b>
		Yes	1,311		972			
	Raced	No	320	24.4	163	16.8	27.73	<b>&lt;0.001</b>
		Yes	991		809			
Proportion that never raced				55.6		46.8		
Female	Records available		2,453		1,511			
	Registered with a trainer	No	852	34.7	537	35.5	0.28	0.60
		Yes	1,601		974			
	Trialled	No	251	15.7	136	14.0	0.07	0.79
		Yes	1,350		838			
	Raced	No	232	17.2	190	22.7	2.74	0.10
		Yes	1,118		648			
Proportion that never raced				54.4		57.1		

**Table 2** Multivariate logistic regression model of breed and gender on attaining the training milestones of being trialled and being raced. Wald test values in bold indicate significance at  $P < 0.05$ .

Outcome	Effect	Factor	Odds ratio (95% confidence interval)	Wald test
Trialled	Breed	Thoroughbred	Reference	
		Standardbred	1.01 (0.89–1.16)	0.79
	Gender	Male	Reference	
		Female	0.86 (0.76–0.96)	<b>0.01</b>
	Breed x Gender		1.22 (1.03–1.47)	<b>0.04</b>
Raced	Breed	Thoroughbred	Reference	
		Standardbred	0.90 (0.79–1.02)	0.10
	Gender	Male	Reference	
		Female	1.05 (0.93–1.18)	0.44
	Breed x Gender		1.58 (1.32–1.90)	<b>&lt;0.001</b>

Multivariable logistic regression models for the outcomes TRIAL and RACE are presented in Table 2. There was a significant interaction between breed and gender in both the TRIAL and RACE models. Breed was no longer significantly associated with TRIAL at the multivariable level, after adjusting for the effects of the interaction term in the model. Breed and gender were no longer significantly associated with RACE at the multivariable level, after adjusting for the effects of the interaction term in the model.

### Discussion

The aim of this study was to investigate the failure of a selected cohort of Standardbred and Thoroughbred horses to reach training milestones. Of the study population, approximately one-third (32.2%) of the population failed to reach the first milestone of being registered with a trainer, which is in agreement with an industry-commissioned report on supply chain wastage that analysed Thoroughbred and Standardbred horses separately (McCarthy 2009). Similarly, in the United Kingdom it has been reported

that 38% of the foal crop failed to enter training by the end of their four-year-old season (Jeffcott et al. 1982). In the 2001/2002-born Standardbred and Thoroughbred population, 42.0% of horses failed to trial, representing a 7.8% loss from the first to second milestone, and 53.8% of horses failed to race. Thus the highest losses in the population occur in the attainment of the first training milestone. Furthermore, the number of Standardbred and Thoroughbred foals being bred each year is steadily declining (Rogers et al. 2009). The reduction in the foal crop depletes the pool of horses available to race which has a flow on effect on wagering turnover, which is the primary revenue stream for the New Zealand racing industries. As 53.8% of the 2001/2002-born foals failed to race in New Zealand this represents a high amount of wastage. However, this figure is similar to the 49% of horses that failed to race in the United Kingdom (Jeffcott et al. 1982).

When stratified by breed and gender, a higher proportion of females failed to reach the registered with a trainer milestone than males of both breeds. Male Standardbreds had the lowest proportion of wastage at each milestone. Male Thoroughbreds had a high proportion of loss between the TRIAL and RACE milestone. This may be a reflection of the industry perception that male horses are more commercially viable for sale and are therefore sought after for the Australian and Asian markets (Fennessy 2010). Within New Zealand many Thoroughbred colts and geldings are prepared to trial level with the primary aim being to sell the horse at this stage rather than have it enter a race. In contrast, many Standardbred horses are primarily prepared for domestic racing rather than export sale. A gender bias is also driven by the alternative use of fillies as breeding prospects whereas many males are geldings and have limited production use outside racing (Perkins et al. 2004a). It was interesting to observe that the gender bias was no longer significant as a main effect within the raced milestone, perhaps reflecting that key decisions regarding racing suitability and gender are made prior to this stage. There was, however, still an interaction of breed and gender, which reflects the differing production and export sale opportunities at this level between the two racing breeds.

The racing industry relies on wagering turnover to gain revenue so must have enough horses starting in races to be commercially viable. However, the declining foal numbers and the loss of horses through wastage within the industry may lead to not enough racehorses being available to fill fields at race meetings, which would have an impact on turnover. The racing industry must quantify areas of loss within the racehorse production supply chain in order to identify possible risk factors for wastage. In this population of 2001/2002-born foals, significant wastage was identified. There is a need for further study to investigate risk factors for horses not attaining training milestones within a wider data set.

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