Preliminary examination of the New Zealand event horse production system

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ABSTRACT

Three day eventing is a sport that places large physical demands on the equine athlete and is a considerable export earner. However there are no published data concerning the size or scope of the New Zealand event horse production system. Quantification of the current production system is important for development of animal breeding programmes and the minimisation of wastage. Retrospective data were obtained from the Equestrian Sports New Zealand horse and rider databases for the 1994/95 to 2000/2001 competition seasons. Basic descriptive statistics were used to describe the horse population. The competitive life of horses registered for the sport of eventing was tested using survival analysis (Kaplan-Meier). Log rank test was used to test the effects of age, sex, breed, horse grade and rider level on survival.

In the 1994/95 season 1612 horses were registered for eventing (5% in advanced, 15% intermediate and 81% in novice grades). Mean horse age was 9.7 ± 3 years and 75% of the horses were geldings. Thirteen breed categories were identified, most horses being either Thoroughbred (46.2%) or unrecorded (43%). Only 56% of the horses registered in the 1994/95 season were still registered six years later. There was no effect of sex, breed, or rider level on survival. Advanced and novice horses had poorer cumulative survival than intermediate horses (40%, 55%, and 64% respectively; log rank 12.06, $P < 0.001$). Not unexpectedly, survival was related to age with horses aged >10 years in the 1994/95 season having a lower cumulative survival (47%) than horses aged < 6 years (60%) or aged 7-10 years (63%) (log rank 25.15, $P < 0.01$).

It appears that novice horses leave the system because of sale or lack of talent. The greater relative loss of advanced horses may reflect either the age of the horses once they reach advanced grade, or possibly the relentless work associated with training and competition.

Further prospective study is required to quantify the reasons for loss in the various age and grade categories.

Keywords: horse; event horse; wastage; industry structure.

INTRODUCTION

Three day eventing is the most physically demanding of the Olympic equestrian sports. The three day event consists of three phases, dressage, speed and endurance, and show jumping with the relative emphasis on the 3 phases being 1:12:3. At international level the speed and endurance phase can consist of 11.6 km of roads and tracks a 7.2 km steeplechase and a 7.4 km cross country course (Anon, 2005). The large weighting given to the endurance phase has suited a thoroughbred phenotype. In the last 20 years the New Zealand (NZ) Thoroughbred has been recognised as the most suitable type of horse for international level eventing, primarily due to its aptitude for the endurance phase of the three day competition. Strong overseas demand for the NZ event horse has resulted in increased export sales and returns. NZ riders now have to pay international prices for event horses.

In NZ all horses competing in three day eventing must be registered with Equestrian Sport New Zealand (ESNZ) and horses competing at internationally sanctioned events (CCI*, **, ***,****) must be registered with the international equestrian federation (FEI, Lucerne, Switzerland). Previous estimates of the NZ horse population have indicated that there are approximately 35,000 horses used for recreation of which approximately 5000 were registered with ESNZ for use in show jumping, dressage or eventing competitions (Rogers, 1993). Internationally, show jumping and dressage are the major equestrian sports with 78% of horses used in these sports (Anon, 2005). Within NZ, dressage and show jumping account for 44% and 38% of horses used in sport and 18% were registered for eventing (Rogers, 1993). In contrast, The Netherlands has 46,300 horses registered for equestrian sport, 43% in show jumping, 43% dressage and only 2.2% for the sport of eventing (Anon, 2005).

In contrast to many of the European sport horse producing and exporting countries, NZ lacks a cohesive and integrated structure linking the breeding and the production sectors. The development of both sectors is limited by the incomplete data describing the production system. The western European producers have traditionally maintained extensive records on competition horses and used these data to generate estimated breeding values. Recently these performance records have been used to describe the survival/longevity of the horses in competition in order to understand and reduce the level of wastage (Ricard & Fournethanocq, 1997; Wallin *et al.*, 2000).

In NZ it is proposed that wastage, particularly in the sport of 3 day eventing, is due to strong overseas demand for the NZ event horse and the strenuous training required to reach competition fitness. However, the lack of available data has limited the

ability of the industry to quantify the magnitude and potential implications of these sources of wastage. This paper examines the registration history of the cohort of event horses in NZ and relates registration life to production variables.

MATERIALS AND METHODS

Retrospective registration records were obtained from ESNZ covering the competitions seasons 1994/95 to 2000/01. The customised Microsoft Access databases (Microsoft Corporation, Washington, USA) contained the registration history, owner, rider details and demographic records for each horse or pony. Within the analysis the data on year of birth, sex, sire, dam (if listed), breed and rider were utilised. Rider status was identified as either professional (a rider having more than 4 horses registered for competition in 1 year) or amateur. In the 1994/95 database it was possible to identify accurately the horses registered for each discipline (show jumping, dressage and eventing).

Statistics

Simple univariate descriptive statistics were used to describe the basic industry structure.

Survival analysis (Kaplan-Meier) was performed with the outcome variable being the registration status of the horse for the next season. Summary measures with confidence intervals and unadjusted odds ratios, measuring the strength of associations of the factors were computed. All analysis was performed using SPSS v12.1 (SPSS Inc, Chicago,Il, USA) with the significance level set at $P < 0.05$.

RESULTS

There was a 9% increase in the number of riders registered for equestrian sport during the six-year period from 1994/95 (4220) to 2000/01 (4600). During this period there was a three-fold increase in the percentage of riders classed as 'professional' riders from 3% to 9.5% (Table 1). Only 2.4% of the 808 riders with horses registered for eventing in the 1994/95 season were categorised as professional and they were the riders of 13% of the registered event horses.

There was a 14% increase in the number of horses registered for equestrian sport from the 1994/95 season. The number of horse registrations peaked and remained relatively constant during the 99/00 and 00/01 season at 4878 and 4853 respectively. For the sport of eventing there was a 39% increase in horse registrations during the 6-year period up from 1113 to an estimated 1556 horses. When expressed relative to the total population of horses used for equestrian sport the numbers involved in eventing increased from 26% to 36%.

The sport of eventing is divided into 3 competition grades based on the cumulative competition points gained by each horse (Advanced grade - horses with more than 60 competition points, Intermediate grade – horses with less than 60 but more than 19 competition points, and Novice - horses with less than 20 competition points) with 55, 198 and 868 horses in each grade respectively in the 1994/95 season. Male horses (1 stallion and 877 geldings) are the most popular choice as an event horse, accounting for 79% of horses registered for eventing. The percentage of male horses increased as the grading of the horses increased from novice to advanced grade 78%, 82%, and 94% respectively. When expressed as an Odds Ratio the male horse is 1.33 (95% CI: 0.88 –2.03, $P = 0.15$) times more likely to progress from novice to intermediate grade and 3.74 (95% CI: 2.51 –5.62, $P = 0.001$) times more likely to progress to advanced grade than a female horse.

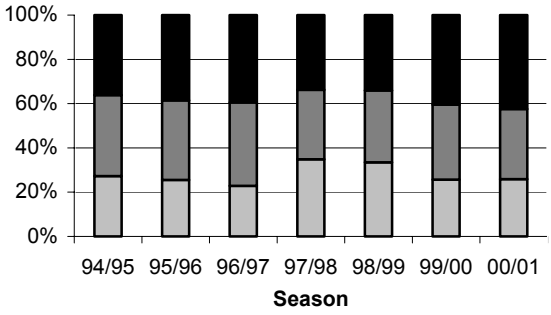
The majority of the event horses in each season were 10 years or younger (62 ± 3.3%) (Figure 1). Horses cannot start in eventing competitions until they are officially 5 years old (taken from the 1 August). In the 1994/95 season 2.5% of horses registered for eventing were 4 years old and therefore ineligible to compete until the following season. The initial data set for the survival analysis consisted of the 1113 horses registered for eventing in the 1994/95 season. This data set consisted of 883 male and 230 female horses that could be allocated to 13 different breed groups. The majority of the horses could be identified from the database as Thoroughbred (4%), with unknown listed as the next most common breed (43%). Warmblood horses represented (3%) and the other breeds accounted for approximately 1% each.

TABLE 1: Distribution of horse ownership and number of horses registered for all equestrian sports during the 1994/95 to 2000/01 competition season.

Horse ownership	Season					
	1994/95	1995/96	1996/97	1997/98	1999/00	2000/01
1	77.7%	63.9%	63.6%	59.3%	64.7%	61.2%
2	15.2%	22.1%	21.7%	24.2%	21.7%	22.9%
3	4.1%	7.3%	7.4%	8.0%	7.0%	8.0%
4 or more	3.0%	6.7%	7.4%	8.4%	6.6%	9.5%
No. of horses	4253	4610	4791	5054	4878	4853

The horses were the progeny of 569 sires, but in 23% of all horses, the sire was unknown. The mean number of progeny representing a stallion, excluding 'unknown' was 1.6 ± 1.6 (range 1 – 26), 88% of the sires had only one horse registered for eventing.

FIGURE 1: Age distribution of event horses (■ 11 and older; ■ 8 to 10; □ 4 to 7, years) during the 1994/95 to 200/01 competition season



Analysis of the raw data indicated that 56% of the horses registered in the 1994/95 season were no longer registered in the 2000/01 season. Including the variables of sex of horse (male or female), grade (advanced, intermediate or novice), breed, age category (4-7, 8-10, and 11 years and older) and rider status (amateur vs professional) into the survival analysis identified a significant effect of grade and age category on the survival probability for a horse (Table 2).

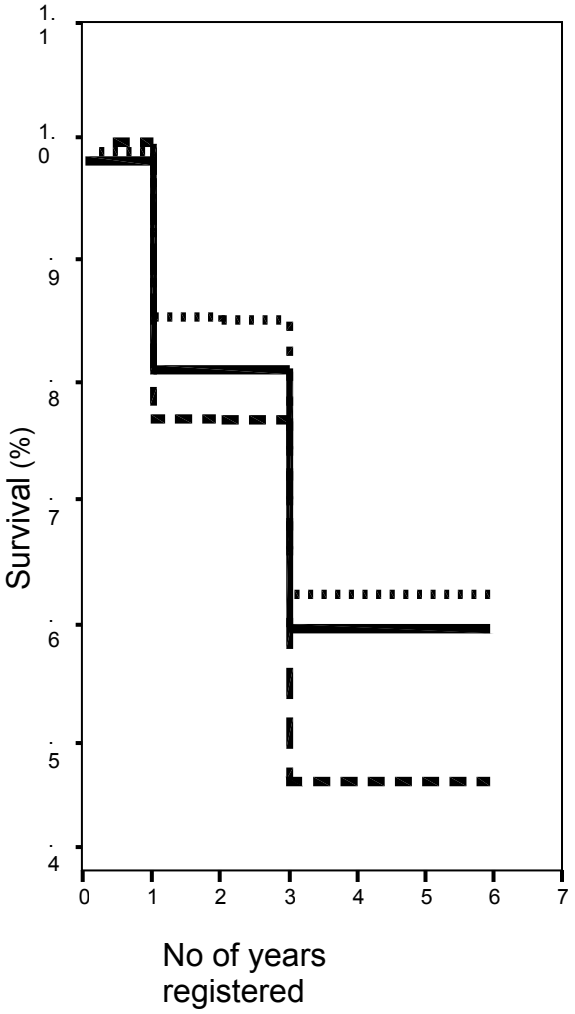
TABLE 2: Survival analysis (log rank test) for event horses registered in the 1994/95 competition season until the 2000/01 season.

Variable	Statistic	Degrees of freedom	Significance
Sex of horse	8.56	1	0.182
Grade of horse	12.06	2	0.0024
Breed of horse	13.5	12	0.3341
Age of horse	25.15	2	0.0001
Amateur or professional rider	0.25	1	0.618

The relative survival functions for the three age categories are presented in Figure 2. Re-registration of the older horse age group was at a lower rate than the mid and young age group. There was no difference in survival probability between the young and mid age group.

Horses of advanced grade had a lower survival probability than the intermediate and novice horses (Figure 3). However, the differences in survival probability were only significant between the Advanced and the Intermediate horses.

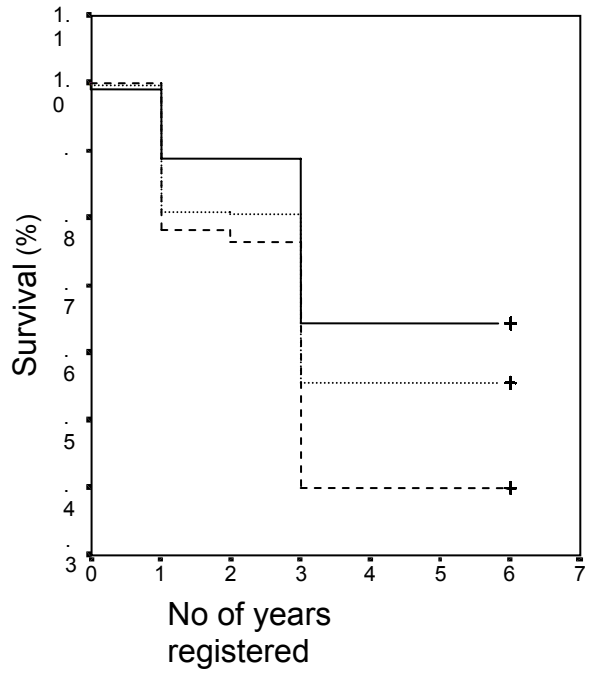
FIGURE 2: Relative survival functions of event horses from the three horse age divisions, young (— 4 to 6 years), mid (---- 7 to 10 years) and older horses (– – – 11 years and older) starting from the 1994/95 competition season.



DISCUSSION

The lack of thorough documentation and description of the equine production systems appear to be a common limitation of many non-continental European countries (Rogers & Wickham, 1993). A number of European countries have already described and reviewed their equine production systems including Germany (Haring, 1980), Sweden (Philipsson *et al.,* 1990; Strom and Philipsson, 1978; Wallin *et al.,* 2000), The Netherlands (Huizinga *et al.,* 1991; Huizinga & Vandermeij, 1989), France (Langlois *et al.,* 1983; Langlois & Blouin, 1997,1998; Ricard & Fournethanocq, 1997) and, more recently, Ireland (Aldridge, 2000). To the authors' knowledge this is the first attempt to describe the event horse production system in NZ and variables that may limit the development of an event horse from novice through to Advanced grade.

FIGURE 3: Relative survival functions for horses in the three eventing grades of novice (---), intermediate (—) and advanced (– – –).



The number of horses registered for equestrian sport has increased steadily since 1994/95 and appears to have stabilised at approximately 4800 horses. The number of riders involved in equestrian sport also increased during this period, reflecting the global trend for increased involvement in equestrian sport (Ricard & Fournethanocq, 1997). It is highly probable that the new horse and rider registrations represent the involvement of new horses and riders to the lower level of competition. Internationally the largest growth in equestrian involvement has been with the recreation/amateur rider. The increase in the relative percentage of 'professional' riders in our dataset may represent the economic opportunities available for more skilled riders to prepare and sell horses to the expanding national and international market.

On an international scale compared with our major competitors NZ has a relatively small industry (Netherlands approximately 40,000 registered sport horses, Ireland 9,956 (Aldridge *et al.*. 2000), and France 45,000, of which 4,000 are registered as event horses (Ricard & Chanu, 2001)). The largest organised equestrian industry in NZ is the Thoroughbred breeding and racing industry. The availability of Thoroughbreds as sport horses, or for the breeding of sport horses, has heavily influenced NZ equestrian culture. The most obvious reflection of this is the high proportion of Thoroughbred horses used in the sport of eventing. Many of the horses with an unknown breed listed in the database were by known Thoroughbred stallions and are highly likely to be full Thoroughbreds, indicating that about 89% of the horses used for eventing in NZ are Thoroughbreds.

With the exception of a brief period in the mid 1990's there has always been a bias against the use of mares in equestrian sport. The male bias is not unique to the NZ production system but the magnitude of the differences is much greater than reported in the literature; Sweden (60% males) (Wallin *et al.,* 2003) and Ireland 62% males (Aldridge *et al.,* 2000). Within the NZ racing industry females have a lower survival probability than geldings (Perkins *et al.,* 2004). This may reflect that the only option for a gelding is to continue with racing or sport whereas females can be retired to the breeding paddock. A similar situation may be occurring within the event horse population. Within the years examined geldings were 3.74 times more likely to progress to advanced level, and 1.33 times more likely to progress to intermediate grade. However, very few mares are even tried at the lower novice level and the low level of females being proven in sport is a major problem for the selective breeding of event horses.

During the observation period 56% of the horses were no longer registered by the 2000/01 season. The size and scope of the retrospective study did not permit us to precisely define the career life of an event horse but did identify trends in survival that are similar to those observed with French jumping horses. Eventing is a sport that places significant demands on the horse's musculoskeletal system and the demands on the horse increase as the horse progresses through the grades. The interaction of age and increasing demands on the musculoskeletal system are a likely explanation for the finding that older and advanced horses were lost to the sport at a faster rate than observed with young and less competitive horses. In Figure 3 the survival probability was less for the novice and the advanced horses in relation to that observed with the intermediate horses. The two primary reasons for wastage in many European horse production systems are lameness/musculoskeletal injury and lack of talent (Ricard & Fournethanocq, 1997; Odberg & Bouissou, 1999). Wastage due to lameness and injury is usually clustered at the very young / inexperienced horses and with the older horses. The less 'robust' horses become injured early in their career or eventually the cumulative wear and tear of a competitive career leads to injury in the older horses. Another major reason for wastage in younger horses is lack of talent. In France show jumping horses that do not earn points in their first year of competition (i.e. lack talent) are 1.9 times more likely to be culled (Ricard & Fournethanocq, 1997). Horses that do not posses the athletic or mental capability to succeed in eventing are quickly identified and transferred to other less demanding equestrian activities.

Without a detailed follow up questionnaire the reason for the wastage of the event horses remains speculation. Industry personnel have proposed that there has been an increase in the sale of young promising horses overseas. If large numbers of young horses were being sold overseas then the survival function for the up to 6-year-old age category should have a large decrease in the 2nd or 3rd year of registration

compared to the other age categories and an associated significant effect of rider status on the survival function of the horses. This was not observed within the current dataset, possibly because of the way the data were structured using the 1994/95 season as the reference/starting year, or because in relation to the number of horses registered for eventing the number of horses sold overseas was relatively small.

In recent years the sport of eventing has faced a number of challenges in response to rider fatalities and lobbying from the welfare groups. In response to this pressure the emphasis on the endurance phase has been reduced and the new short course format introduced. These changes have reduced the advantage of the Thoroughbred horse and now favour the part Thoroughbred horse or the Thoroughbred x Warmblood cross. It is probable that if NZ wishes to maintain its position as a major producer of international level event horses that there will be a subtle shift in the type of horses selected for eventing towards horses with some Warmblood ancestry. This change in desired horse type opens up the possibility of utilising overseas genetics and overcoming the limitations of the small NZ event horse gene pool/population.

The heritability of eventing is low to moderate (0.11 –0.17) but there are moderate positive genetic correlations with show jumping (0.45) and dressage (0.58) and therefore it is practical to develop a selective breeding programme for event horses. (Ricard & Chanu, 2001). Traditionally the main source of event horses has been male thoroughbred horses retired from racing. In recent years we have observed and increase in demand from the Asian countries for the male NZ Thoroughbred. Approximately 40% of the thoroughbred foal crop is exported and the majority of these are male horses (Anon, 2004). The ready supply of good quality thoroughbred horses retired from racing was historically a major impediment to the development of a national breeding programme for event horses. However, the reduced supply of quality retired racehorses in NZ and the change in the format of eventing to the 'short course format' with a greater emphasis on the dressage and show jumping phases, traditionally the strong point of the Warmblood breed, mean that a national breeding programme may be sustainable.

CONCLUSION

The event horse production system is limited by its small size and the production of a product for an international niche market. The historical reliance on the Thoroughbred has limited the development of a national selective breeding programme. Possibly as a reflection of the low to moderate heritability of event competition success and selection of horses from a population bred for race success, the horses are the progeny of a large number of sires. However, the increasing number of professional riders indicates that the production of event horses may provide significant financial remuneration. The loss of horses from competition indicates a pattern of young horses removed due to lack of talent and loss of older experienced horse due to musculoskeletal injury.

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