

A survey of reproductive success in South African Thoroughbred horse breeding from 1975 to 1999

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ABSTRACT

The data and an analysis of the statistical summaries from the 'Return of Mares' of the *General Stud Book* of The Jockey Club of Southern Africa from 1975–1999 are presented. The total number of mares covered per season ranged from 7393 (1992) to 5180 (1995). The total living produce in the period surveyed was 95 317 foals. The categories of data examined include: the total number of mares covered per season; the total numbers and percentage of their living produce; the total numbers and percentage dead produce, 'slips' and foals born dead, barren and 'no return' mares; and the total number of live twins reported. The percentage live foals per season increased from 52 to 62 % and the percentage barren and 'no return' mares declined from 35.50 to 28.40 % over the period surveyed. The number of live twins reported showed a dramatic reduction from 156 to 5. These apparent improvements are ascribed to a combination of factors including advances in veterinary knowledge and technology. The findings are similar to those reported by similar surveys of national Thoroughbred populations from North America and Germany. There is an indication to broaden this annual survey by recording additional parameters more accurately reflecting reproductive efficiency rather than a cumulative annual total of live foals.

Key words: horse, reproduction, Thoroughbred.

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Records of reproductive performance in Thoroughbred horse populations

Surveys of pregnancy rates per cycle reportedly vary from 43–56 % in Thoroughbreds, Standardbred and Quarter Horse mares⁷. These authors also report cumulative end-of-season pregnancy rates and foaling rates of 70–80 % and 50–70 %, respectively, in a number of studies. Surveying Thoroughbred population data over a 5-year period in North America showed a yield of 241 958 foals (a 5-year average of 59 %) for 40 512 stallions bred to 408 275 mares⁴.

Reproductive performance of the Thoroughbred as a breed has been and continues to be influenced by several additional factors. These primarily include a traditionally imposed official breeding season related to age-imposed horse racing. This is partially at odds with the normal physiological breeding season. The mare is seasonally polyoestrous with multiple oestrus (and ovulatory) cycles confined to a 'breeding season' determined by long day-length⁴. The artificially imposed Thoroughbred breeding season with the official birth date of all registered Thoroughbred horses being 1 August in South Africa obviously influences the opportunities for mating and establishment of pregnancy (reproductive success).

There have additionally been no selection criteria in the breed other than for pedigree and athletic performance. There is furthermore a complete restriction on any form of assisted or artificial reproduction technology.

Factors contributing to reproductive performance

A number of factors thought to contribute to reproductive performance have been reported^{5–8}. Only a few of these factors have been assessed through controlled studies. The following list includes some of the reported factors thought to influence overall reproductive performance:

1. booksize^{5,7};
2. mare availability⁵;
3. mare age^{6,7};
4. mare status^{7,8};
5. economic factors⁶;

INTRODUCTION

Reproductive success as an assessment of reproductive performance

Whether a specific mare produces a live foal or not will define her reproductive success. Reproductive success as an assessment of reproductive performance of broodmares is most commonly documented by recording foaling rates by either one of 2 methods. First, per season, and second, per cycle foaling rates. An increase in reproductive success for an individual mare, farm or population is reflected by an increase in either or both of these⁴.

The per season rate is independent of the number of coverings (and cycles) it took to result in a live foal. There is also little indication of the role of pregnancy attrition prior to the point of foaling. It

fails to adequately evaluate the contribution of the stallion and other aspects central to reproductive management. The preferred parameter is thus the per cycle rate as it takes into account the number of oestrous cycles a mare is bred in order to produce a foal. Recording this parameter allows analysis of reproductive efficiency in terms of not only the cumulative seasonal success, but also the management effort and veterinary input.

Average ('normal') reproductive performance of broodmares

Internationally, the largest record repositories for broodmare reproductive performance are those for Thoroughbreds provided by the various national jockey clubs. Generally these are annual records of the live returns to registered mares comprising a national population on a per season live foaling rate. The jockey clubs are currently unable to monitor and record each cycle on which a particular mare is bred. No per cycle population success rates are thus available. There are, however, data in several instances providing per cycle live foaling rates for particular farms.

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Table 1: Summary of reproductive data of registered Thoroughbred mares in southern Africa for breeding season intervals from 1975 to 1999.

Year of birth	Mares covered	Living produce		Dead produce		Slips and stillborn		Barren & no return		Twins
	(n)	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)	
1975–79	30 386	15 887	52.3	930	3.1	2 866	9.4	10 679	35.1	192
1980–84	37 066	19 165	51.2	1348	3.6	3 189	8.6	10 025	27.0	165
1985–89	34 371	20 364	59.2	1327	3.9	2 976	8.7	9 888	28.8	138
1990–94	33 410	19 892	59.5	1272	3.8	2 590	7.8	9 767	29.2	25
1995–99	27 535	16 917	61.4	682	2.5	2 076	7.5	7 967	29.0	5

6. Stud Health programmes⁶;
7. stallion factors^{5,6,7,8}, and
8. month of mating^{5,7}.

The Jockey Club of Southern Africa initiated statistical analysis of reproductive performance in 1974 by recording 'living produce'. Until the 1970s, all reports seem to indicate only that the live foal percentage was below 50 %, with a mare population of approximately 6500. There was reportedly an 'overall pregnancy rate' of 72 % for the years 1960–1962¹.

MATERIALS AND METHODS

This retrospective study analysed the data available from the statistical summaries published annually from 1976 by the Jockey Club of Southern Africa. The publications appeared as the *General Stud Book of South Africa*, Supplements to Vols 21–25 (Return of Mares 1975–76 to 1990–91) and *The General Stud Book of Southern Africa*, Supplements to Vols 25–27 (Return of Mares 1991–92 to 1999–2000)^{2,3}. These summaries are derived from the information supplied to the Jockey Club on an annual basis for purposes of registration of mares at stud and their living produce. The reported data were subdivided into several categories selected for this study as being the most accurate indicators of average reproductive performance of Thoroughbred broodmares. The categories were the following: total number of mares recorded; total number of mares covered; total number of living produce (including the total number of colts and fillies, respectively); and total number of live twins reported. The percentage of live foals born by month was also derived from the data.

The categories of 'slips and stillborn' and 'barren and no return' as reported were also examined. The 'no return' component included in the category of 'barren and no return' mares is difficult to define and report on with accuracy. The category includes barren mares, mares that have aborted singleton foetuses or twins, mares that produce weak or dead singleton foals or twins at term, foals dying *post partum* and foals that are not registered. There is a probable overlap of this category with that of 'slips and

stillborn'. Both categories probably reflect other components of pregnancy wastage and incomplete reporting, including unreported barren mares, dead or stillborn foals, 'slipped foals' and twins.

Data analysis

All categories were examined within five data cohorts, each comprising 5 successive breeding seasons. The first cohort shows data reported for the years of birth 1975–79 and represents the produce for mares covered in the breeding seasons of the years 1974–78. The last cohort similarly represented the data for the years of birth 1995–99, and of mares covered during the 1994–98 breeding seasons. The means of the categories were then calculated for each 5-season cohort. The first and last cohorts were then compared to establish any trend between the inception of data reporting and the most recent breeding seasons.

RESULTS

Table 1 summarises the data surveyed between 1975 and 1999. All categories examined are shown. The largest number of mares covered in a particular season (data not shown) was in 1992 (7393). The lowest number of mares covered was 5180 in 1995 (data not shown). Between 1975

and 1999, a total of 95 317 live foals was born.

Between 1975 and 1979, a mean annual live foal production rate of 52.3 % was recorded. The final data cohort (1995–99) shows 61.4 % mares covered produced live foals (Fig. 1). The last season surveyed (1999), shows a live foal percentage of 62.0 % (data not shown).

The reported percentages of both dead produce and 'slips and stillborn' in the study period has stayed relatively consistent with a mean cohort range of 2.5–3.9 % and 7.5–9.4 %, respectively (Table 1).

The 'barren and no return' category however has shown a positive trend with a decline from 35.1 % in the 1975–79 breeding seasons to 29.0 % in the final cohort until 1999 (Table 1).

The reported incidence of living twins was radically reduced with a mean of 127.75 live twins per season between 1975 and 1990 dropping to a mean of 7 reported live twins per season between 1991 and 1999 (data not shown).

Figure 2 shows the percentage of live foals born per month for the 1975–99 breeding seasons.

DISCUSSION

The South African survey presents data similar to those reflected in other studies

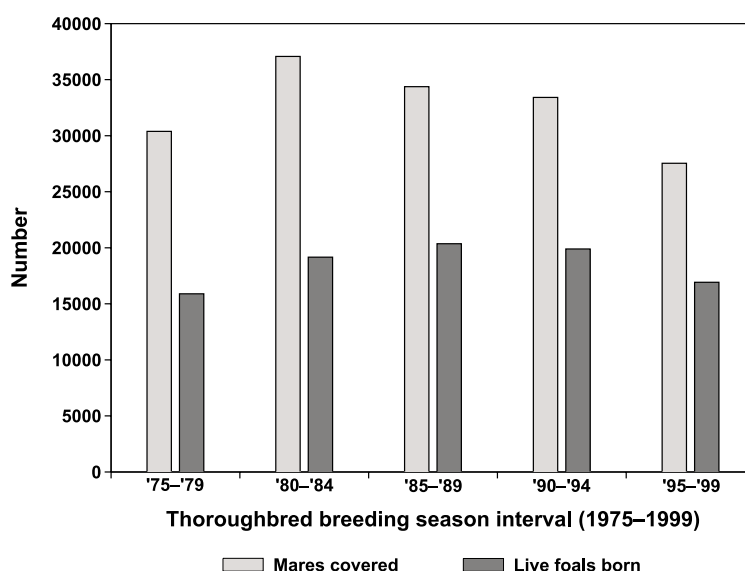


Fig. 1: Number of registered Thoroughbred mares covered and live foals produced during each of the 5-year intervals of the study (1975–1999).

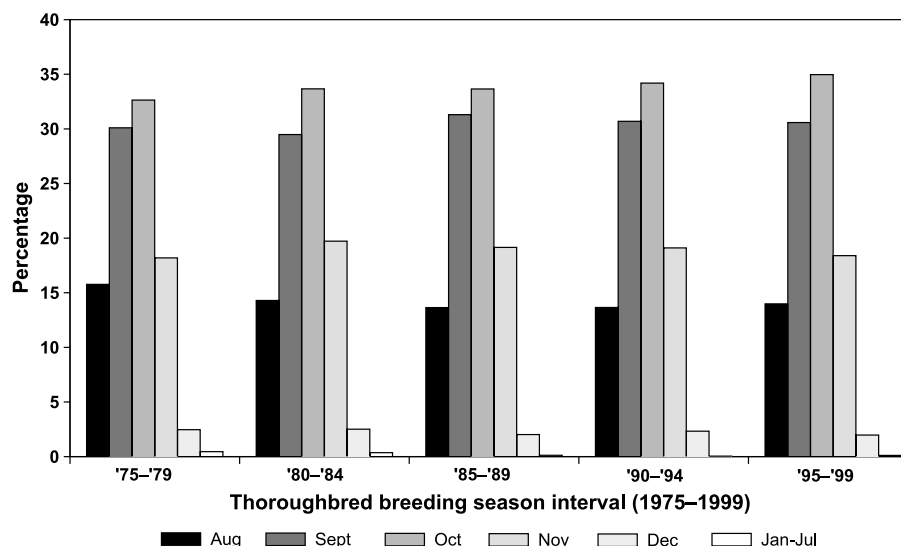


Fig. 2: Percentage live foals born per month of each of the South African breeding season intervals in the study (1975–1999).

undertaken in recent years covering a similar period and categories of Thoroughbred horse populations in the North America and Germany⁴⁻⁶. These reported on the much larger and smaller North American and German Thoroughbred populations, respectively, as well as data from 4 well-managed stud farms in the State of Kentucky⁴⁻⁶.

The number of mares being covered per season is similar at both the beginning of this survey and the present day. This period also marks some significant fluctuations in the economic scenario in South Africa. By extrapolation to data from other countries it can be assumed that this is reflected in the number of mares covered per season and hence the number of live produce, if not the percentage on a per season basis.

The percentage of living produce over the period from 1980 was consistent around the 60.0 % mark. This reflects a considerable improvement on the mean of 52.4 % in the initial period surveyed from 1975–1979. During this latter period of the survey there were several significant innovations in breeding technology and advances in the field of equine reproduction applied in South Africa. From this period onwards there was increased utilisation of PgF2-alpha and other pharmacological agents for manipulation of the mare's cycle and induction of ovulation. The widespread utilisation of diagnostic ultrasound from the mid-1980s and the Stud Health Scheme in 1980 has

undeniably also played a role.

The categories of percentages of dead produce and of 'slips and stillborn' mares appears relatively unchanged. The percentage of 'barren and no return' mares as a proportion of the overall population is, however, declining and the incidence of twins being born is almost negligible.

The distribution by month of birth, of all live foals born between 1975 and 1999 has remained consistent throughout the survey with most foals being born in September and October each year.

Similar studies suggest that improved overall management and Health Schemes do have a positive impact on reproductive success. The positive effects on pregnancy rates of both increased mare availability and increased booksize in North American studies reflect this. These undoubtedly result from improved management, e.g. ensuring earlier ovulatory cycles and optimal stallion utilisation. Other important factors appear to be the application of infectious disease surveys, the average age of the mares in the breeding populations and the overriding dictates of economics.

The improvements in veterinary knowledge and technology contributing to a decline in the proportion of barren mares and pregnancy wastage due to factors such as twinning should arguably have yielded more dramatic improvements to the live foal yield. It is currently impossible to reliably comment on the impact of these innovations on reproduc-

tive efficiency as reflected by parameters such as per cycle foal rate due to the non-availability of these data. If these were available it will permit the analysis of the efficiency of reproductive management. Ultimately this may answer the question of whether or not real progress is being made.

There is an indication to broaden this annual survey by recording additional parameters more accurately reflecting reproductive efficiency rather than a cumulative annual (per season) total of live foals. This will require the recording of per cycle reproductive data such as a live foal percentage per cycle. Other useful parameters to evaluate would be recording the mean age of broodmares and the individual farm average booksize for their stallions as well as individual stallion booksize and their effect on both the per cycle and per season foal percentages. These data will be more readily accessed with the introduction of computerisation, and a standardised reporting system based on individual microchip identification of mares and their produce. This is readily integrated with the current computerised system of recordings obtained from all registered Thoroughbred broodmares, stallions and foals.

REFERENCES

1. Du Plessis J L 1964 Some observations and data in Thoroughbred breeding. *Journal of the South African Veterinary Medical Association* 35: 215–221
2. *General Stud Book of South Africa 1975–1991*. Return of mares for 1974/75–1990/91, Suppl. to Vols 21–25. The Jockey Club of South Africa, Johannesburg
3. *General Stud Book of Southern Africa 1992–2000*. Return of mares for 1991/92–1999/2000, Suppl. to Vols 25–27. The Jockey Club of Southern Africa, Johannesburg
4. McDowell K 2001 Reproductive success in broodmares – Part 1. *Equine Disease Quarterly* 9: 4–5
5. McDowell K 2002 Reproductive success in broodmares – Part 2. *Equine Disease Quarterly* 10: 2–4
6. Merkt H, Klug E and Jochle W 2000 Reproduction management in the German Thoroughbred breeding industry. *Journal of Equine Veterinary Science* 20: 822–868
7. Morris L H A, Allen W R 2002 Reproductive efficiency of intensively managed Thoroughbred mares in Newmarket. *Equine Veterinary Journal* 34: 51–60
8. Pascoe D R 1990 Factors to increase breeding efficiency at farm level. *Proceedings of the 12th Bain-Fallon Memorial Lectures: Current Issues in Equine Practice*: 179–184