

HIDDEN COSTS OF DYSTOCIA: FERTILITY AND LONG TERM SURVIVAL IN DAIRY COWS

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SUMMARY

This paper reports two of the short and longer term outcomes of dystocia for the cow. Calving interval (a measure of cow fertility) may be increased by up to 42 days following a difficult calving. Cow survival may also be reduced, though farmers rarely identify a difficult calving as a cause of a culling or death of a cow more than a month after calving. We investigated the varying culling rates for cows following differing degrees of calving difficulty, particularly cows culled soon after calving, or later than 21 days after calving. Any degree of calving difficulty reduces cow survival and fertility, depending on the severity of dystocia.

Keywords: Dystocia, dairy cattle, survival, fertility.

INTRODUCTION

Dairy farmers are usually acutely aware of the immediate costs associated with difficult calvings: the farmer's time, veterinary and medication costs, and cow and calf loss. However, some of the longer term outcomes are rarely considered, and their costs are generally ignored. It is important to know these costs so that the true impact of the genetic variation of calving difficulty between bulls may be estimated.

Dystocia can result in the early death or disposal of a cow (Dematawewa and Berger 1997) or reduced fertility (McDaniel 1981) and is a source of economic losses to the dairy farmer. Estimates of the effect of dystocia on cow survival and cow fertility vary widely depending on cow age, the recording system and the environment in which the cow lives. The increased likelihood of cow death following dystocia varies according to the parity of the cow and the degree of dystocia: Dematawewa and Berger (1997) found it ranged from 0.13% for primiparous cows requiring slight assistance to 4% for mature cows having extreme difficulty, although this study was not able to estimate the numbers of primiparous cows that died before they had initiated a lactation record. Philipsson (1976) found emergency slaughter rates of 3.5% for Swedish cows with dystocia, and 6% for cows that had stillborn calves. These figures may vary considerably between populations, partly because of the variety of scoring systems that are used for measuring the occurrence of dystocia: for instance, a cow requiring an easy pull is classed as having a normal calving in the Netherlands (de Jong 1998), but is scored as an assisted calving in Australia. This means that comparison of events associated with different degrees of dystocia may be difficult across countries and recording systems. Likewise, conditions in Australia are very different to those of Europe and North America: our herds are large (O'Connor 2002), pasture based, and are rarely housed. This may alter the effect of dystocia on cow survival and calving interval. We therefore investigated the short and

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long term effects of dystocia, as scored in Australia on primiparous and multiparous Holstein-Friesian cows.

MATERIALS AND METHODS

No single database contains complete information about death and culling of cows, so different databases were combined to obtain a more complete analysis.

Trait definitions. *Survival* was calculated from records of calvings that were provided from the Australian Dairy Herd Improvement Scheme, (ADHIS) consisting of 801,652 records collected since 1981. These data were a subset of data obtained by ADHIS, which currently collects information on the performances of approximately 55% of Australia's 2.1 million dairy cows. The calving ease scoring system is not linear (see Table 1), and has two 'normal' calving classes, the observed and the unobserved.

Table 1. ADHIS dystocia scores by parity, frequencies and rescaling

description	ADHIS calving ease score	proportions of calvings	
		primiparous	multiparous
unobserved - not ok	1	0.02	0.02
unobserved - ok	2	0.41	0.62
observed - ok	3	0.26	0.24
observed - easy pull	4	0.19	0.08
observed - very difficult	5	0.10	0.03
observed - surgical	6	0.004	0.001
observed - malpresentation	7	0.02	0.01

There is no definition as to the distinction between 'observed' and 'unobserved' which leads to some confusion. 'Unobserved - not ok' indicates that the calving was not seen or assisted, but was obviously unsatisfactory, for any unspecified reason: possibly there was a uterine prolapse, or the calf was

half born before milk fever caused labour to stop, or the cow was found dead and the calf partly expelled. Herds that scored all calvings as either normal, or who only reported difficult calvings were excluded from this analysis. This is in contrast to current ADHIS calving analysis that excludes all unobserved calvings (whether normal or difficult) from the analyses on the basis that unobserved data is of no statistical value. After removal of twin calvings, inductions and incomplete records (such as absence of sire of dam, sex of calf), a total of 134,141 calving records remained, resulting from artificial insemination of Holstein-Friesian cows with semen from Holstein-Friesian bulls. Cow termination (cow sold or died) dates were provided by ADHIS from information provided by farmers (79,624 records of cow ID numbers and termination date). Farmers have the option of providing this information (but most do not). These records were matched with the calving records for dystocia score, which included date of calving. This enabled us to determine how long after calving the cow had been terminated. Inconsistent records were excluded, such as records with termination dates appearing before calving dates. This dataset was recoded for early terminations (terminations before 22 days post partum), and late terminations (between 22 and 380 days, inclusive, post partum).

Calving interval is a measure of cow fertility: a longer calving interval is indicative of possible reduced fertility. Cows that had two consecutive calvings were identified. The calving interval (recoded as a deviation from 365 days) was calculated between pairs of successive calvings of a cow, for all available

pairs of parities. Calving intervals of less than 280 days or more than 665 days were excluded. 23,044 records of pairs of calving records remained, of which 4,703 were cows with a primiparous initial record. A linear model was used for all analyses with ASReml (Gilmour *et al.* 2002) :

$$y_{ijklmn} = \mu + ce_i + s_j + p_k + m_l + hys_m + e_{ijklmn}$$

Where:

- y_{ijklmn} denotes the response variable:
 - cow death (less than 22 days) (coded as 0 = survived 100 = died)
 - cow death (more than 21 days) (coded as 0 = survived 100 = died)
 - calving interval (days deviation from 365 days, between calving of interest and the subsequent calving)
- μ denotes the population mean
- ce_i denotes the fixed effect of the i^{th} calving ease categories (ADHIS)
- s_j denotes the fixed effect of j^{th} calf sex
- p_k denotes the fixed effect of the k^{th} parity of the cow
- m_l denotes the fixed effect of the l^{th} month
- hys_m denotes the fixed effect of the m^{th} herd-year-season
- e_{ijklmn} denotes the error associated with the $ijklmn^{th}$ calving record

Sires and maternal grandsires were not included in this analysis. Analyses were completed with parity as either all parities (1 – 9), primiparous (parity 1), or multiparous (parity number (2 – 9)). Further details of editing, analyses and interactions may be found in McClintock (2004).

RESULTS AND DISCUSSION

Primiparous calvings resulted in more dystocia (43%) than multiparous calvings (14%). However, within each dystocia category, there was usually no significant difference in cow survival rate between primiparous and multiparous calvings (Table 2): The ‘unobserved – not ok’ categories resulted in more cow mortality immediately after parturition, with a 7% increase for primiparous cows and 4% for multiparous cows. Even an ‘easy pull’ reduced the cow survival rate, by about 1% for primiparous calvings, and slightly less for multiparous calvings.

Table 2. Reduction in primiparous and multiparous cow survival, compared with normal calving, following different degrees of calving difficulty (with standard errors)

ADHIS calving score		< 22 days post partum		> 21 days post partum	
		multiparous	primiparous	multiparous	primiparous
unobserved - not ok	1	0.040 (0.003)	0.071 (0.007)	0.027 (0.003)	0.012 (0.014)
unobserved - ok	2	0 (0)	-0.003 (0.004)	0.000 (0.000)	0.000 (0.006)
observed - ok	3	0.000 (0.001)	0 (0)	0 (0)	0 (0)
observed - easy pull	4	0.012 (0.002)	0.009 (0.004)	0.007 (0.002)	0.015 (0.007)
observed - very difficult	5	0.027 (0.002)	0.013 (0.009)	0.027 (0.002)	0.015 (0.009)
observed - surgical	6	0.031 (0.009)	0.020 (0.016)	0.168 (0.009)	0.154 (0.035)
observed - malpresentation	7	0.006 (0.003)	0.028 (0.005)	0.040 (0.003)	0.033 (0.017)

Longer term survival rates improved for most calving categories, compared with survival immediately post partum. The exception was the category of cows requiring caesarian sections or foetotomies: after the heroic efforts of the surgery, the cow survived well initially, but was culled (often for poor fertility, low production or lameness). Calving difficulty was never given as the reason for termination of the cows terminated more than 21 days after calving. This reduction in survival applied to all parities, as an

extra liability, in addition to the reduced survival associated with increasing parity, as shown for 'hard pulls' in Figure 1. Similarly an easy pull was associated with an increase in calving interval of more than six days, for all cows. Generally calving intervals were slightly longer following primiparous dystocias rather than multiparous ones (but not always significantly so).

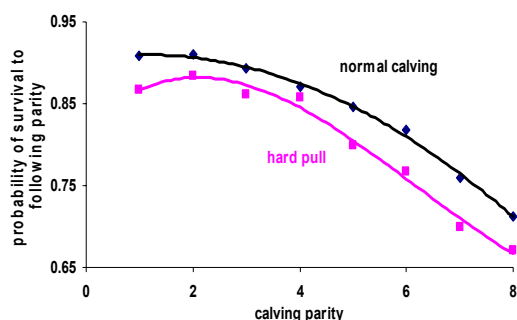


Figure 1. Reduced probability of survival for cows that had 'hard-pull' calvings compared with normal (unassisted) calving.

Table 3. Change in cow fertility (measured as calving interval) following varying degrees of calving difficulty, compared with normal (unobserved - ok) calvings (with standard errors)

		increased calving interval (days)	
		primiparous	multiparous
unobserved - not ok	1	16.52 (5.64)	9.49 (3.25)
unobserved - ok	2	0.00 (0.00)	0.00 (0.00)
observed - ok	3	-0.90 (2.34)	0.37 (1.04)
easy pull	4	6.39 (2.75)	6.42 (1.73)
hard pull	5	13.08 (3.79)	6.87 (2.59)
surgical	6	23.51 (27.80)	19.56 (27.33)
malpresentation	7	24.28 (8.13)	10.24 (4.50)

These results were used to produce costs of dystocia (McClintock, 2004). Reduced cow survival accounted for 19% of the costs of primiparous calvings, and 22% of mature cow calving costs. Reduced fertility accounted for 33% and 27% of costs respectively. These total more than 50% of all costs of dystocia.

CONCLUSIONS

Reduced fertility and cow survival are both influenced by the degree of severity of any dystocia, with even slight dystocia reducing survival and fertility.

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