Quantifying the effect of the InCalf™ farmer action group

T S Brownlie¹, ², J M Morton³, C Heuer², S McDougall¹
¹ Cognosco, Animal Health Centre, PO Box 21, Morrinsville ² Epicentre, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Private Bag 11222, Palmerston North 4442, New Zealand ³ Jemora Pty Ltd, PO Box 2277, Geelong, Victoria 3220, Australia.

Introduction

In the four years following the launch in 2008 (Burke 2008), the InCalf™ reproductive extension programme has been adopted by many key rural professionals and veterinary practices as the standardised approach to dairy herd reproduction consultation. There has been encouraging case study evidence of success in individual herds but its efficacy as a national tool to raise the national six week in-calf rate needs to be determined.

The previous benchmarking study of reproductive performance of New Zealand dairy herds, undertaken in 1998 to 2000, found the national mean pregnancy rate at 42 days after the mating start date (MSD) was 68% with a wide range between herds (Xu 2003). Estimates were based on non-return rates rather than early pregnancy testing. A second study that explored the 42 day calving rate over the preceding ten years found a decline of 10% from 69.7% in 1991 to 59.3% in 2003 (Harris 2005, Harris 2006). Although these are somewhat different measures, they represent the most recent benchmark for the industry. The results from the benchmarking study by Xu were used to set targets for reproductive performance of the New Zealand dairy industry and those adopted by InCalf™.

The National Herd Fertility Study was launched in 2009 to evaluate performance ten years after the previous benchmarking study. Unlike the previous study however, it used mandated ‘early’ pregnancy diagnosis to accurately capture the reproductive status of all cows in the study herds. A further objective was to quantify the effect of the InCalf™ Farmer Action Group using this measured performance in a randomised controlled trial.


Study design

The study was carried out in four dairy intense areas of New Zealand; Waikato and Taranaki in the North Island and North Canterbury and South Canterbury/ North Otago in the South Island. These regions were purposively chosen to represent a diverse cross section of the dairy industry both geographically and demographically. Within each region dairy herds were nominated from the client base of a regional coordinating veterinary practice.

A number of eligibility criteria were imposed in order to preserve the longevity of herds within the study. Eligibility criteria were: being a client of the participating veterinary clinic, having >90% of the herd calving annually between 01 June and 30 November (i.e. seasonal, predominantly spring-calving herds), a key decision maker that was expected to remain on the same site for the subsequent two years of the study, and the willingness of the key decision maker to follow the protocol for the study.

Initially within each region, eligible herds were ranked on the proportion of cows diagnosed pregnant 42 days after the MSD or their estimated six week in calf rate (InCalf™ fertility focus report (MINDA; Livestock...
Improvement Corporation or MISTRO; CRVAmbreed) for the season preceding the intervention (termed “pre-treatment six week in-calf rate”). Within this rank, herds were blocked with consecutive herds then randomly assigned within these blocks to an intervention or a control group. This ensured that there was minimal bias between groups with regard to reproductive performance. The intervention was enrolment in the InCalf™ Farmer Action Group for the subsequent 2009/10 season. Group size was restricted to 18 farms due to the impracticalities of offering the InCalf™ Farmer Action Group to groups of any larger size while allowing some loss to follow up. Where more eligible farms were available in a region, a third control group was randomly allocated. This third group had no measurements conducted on-farm; however data from the national dairy database were accepted for analysis and served to quantify the effect of on-farm measurements in the control group. It was anticipated that on-farm measurements and interviews may, just on their own, raise the level of herd owner awareness and invalidate their control status.

The principle measure of effect in the study was change in the six week in-calf rate over the subsequent two seasons following enrolment (2009/10 and 2010/11) between the treatment and first control group. The study mandated and funded pregnancy testing visits 84 to 96 days after MSD for both study seasons.

Results

Following enrolment, 168 herds were ranked on their pre-enrolment six week in-calf rate then randomly allocated within blocks of adjacent six week in-calf rate to a treatment group that was offered the InCalf™ Farmer Action Group (n=73) or one of two control groups, one actively monitored (n=73) and one passively monitored (n=22). In total, 25 herds were lost to follow up or excluded from the analysis due to incomplete records. The remaining 144 herds comprised 238,478 eligible lactations over three seasons, including the pre-enrolment 2008/09 season. The intervention and first control group supplied 181,286 aged pregnancy tests for the two study seasons.

The mean six week in-calf rate for the control group was 65% (SD=7%) in 2009/10 and 67% (SD=8%) in 2010/11 and 67% (SD=7%) and 69% (SD=8%) for the treatment group respectively. This was associated with a crude mean three week submission rate of 81% (SD 9%) (81% in 2009/10 and 82% in 2010/11) and a first service conception rate of 48% (48% in 2009/10 and 48% in 2010/11).

A multivariate model evaluating the effect of key decision maker participation in the InCalf™ Farmer Action Group found an overall 2% improvement in six week in-calf rate due to participation (p=0.05). The model controlled for season and region.

Interaction terms were also tested between treatment group and biophysical and socio-demographic factors. None were strongly significant however; trends were found and are reported.

Figure 1 presents the marginal mean estimates (with 95% confidence intervals) for the three way interaction term of allocation to an InCalf Farmer Action Group by region and herd-year (p=0.94). From this plot, the 2% risk difference could be seen in both north island regions for both herd-years however a contrast was seen between the South Island regions where North Canterbury saw a mean 5% improvement over both herd-years whereas south Canterbury 0.02% overall decline in six week in-calf rate during the two herd-years.

The effect of pre-enrolment (prior) reproductive performance was found to be highly significantly (p<0.01) associated with current performance at a univariate level. When the interaction of quartile of pre-enrolment six week in-calf rate and allocation to the InCalf™ Farmer Action Group was examined (Figure 2) a non-linear relationship was found, with the most marked difference in the lowest quartile of performance where an approximate risk difference of 4% was found (p = 0.80) between the InCalf™ and control group.
Figure 1. Plot of marginal mean estimates of six week in-calf rate by the interaction of allocation to an InCalf Farmer Action Group (grey bar) or a control group (white bar) and region and season, where 2009 and 2010 are the starting year of each season. Error bars denote 95% confidence intervals around the estimate.

Figure 2. Plot of marginal mean estimates of six week in-calf rate by the interaction of allocation to an InCalf Farmer Action Group (black line) or a control group (dashed line) and quartile of year’s dairy farming experience. Error bars denote 95% confidence intervals around the estimate.

Similarly, when interaction of years of experience as a dairy farmer and allocation to the InCalf™ Farmer Action Group was tested (Figure 3), a non-linear trend was found suggesting that the greatest benefit of the treatment was in key decision makers in the lowest and highest quartile of years’ experience. Again, although non-significant (p=0.55) the relationship was considered plausible and reported accordingly.
Quantifying the effect of the InCalf™ farmer action group

2.04.4
Proceedings of the Society of Dairy Cattle Veterinarians of the NZVA, 2012

Figure 3.: Plot of marginal mean estimates of six week in-calf rate by the interaction of allocation to an InCalf Farmer Action Group (black line) or a control group (dashed line) and the quartile pre-enrolment estimate of six week in-calf rate. Error bars denote 95% confidence intervals around the estimate

Discussion

This study describes the current reproductive performance of a subset of New Zealand dairy herds. Performance appears to have remained almost static over the last 10 years; an encouraging finding following the reported apparent decline in 42 day calving rate the 1990’s (Harris 2005), but conversely, this means minimal to no gains have been made towards national targets set following the last benchmarking study in 2000. The current national target is, by 2016, to achieve a national average six week in calf rate of 78% with a minimum of hormonal intervention. This seems unlikely without substantive change in herd management and decision making. A substantial range still exists in performance which suggests that causal factors are most likely at the herd level and, if identified and modified, improvements to performance could be made. However, this study also found a positive effect on reproductive performance through involvement in the InCalf™ Farmer Action Group in the two year period during and following enrolment in the extension programme.

Although demographic data indicate that study herds were representative of the regions sampled (Brownlie et al. 2011), the regions were purposively selected so some bias may have resulted. Furthermore, farmer self-selection to exclude themselves once enrolled, may have introduced further bias. Despite this, the remaining sample represented approximately 3% of the national dairy cow population and the randomized controlled study design ensured any inferences made concerning the effect of the InCalf™ extension programme were robust.

An overall positive effect of herd enrolment in the InCalf™ Farmer Action Group was encouraging and, at a national level, suggests that the intervention was worthwhile. When considering the representative farmer sample, the relative short duration for change to occur and the complexity of reproduction management, this is an encouraging result for the InCalf™ programme.

From a rural professional’s viewpoint, there were few significant associations between the biophysical and demographic factors and the improved reproductive performance associated with the effect of InCalf™. Put another way, this indicated that InCalf™ should be effective over a range of regions, herd size or farmer occupations (i.e. sharemilker; owner-operator). Years’ of dairy farming experience had a non-linear but plausible interaction with allocation to the InCalf Farmer Action Group (p=0.55) suggesting that the effect might be better in the highest and lowest quartiles of experience.

The greatest response to InCalf™ occurred in those herds in the lowest quartile of six week in-calf rate before the study started. Poorer performing herds had more opportunity to improve than higher performing herds. The relationship appeared to be almost linear with the highest performing herds making little or no change. This finding has been identified in a demonstration study in the US (Cassel et al. 1994, Peters et al. 1994). This should challenge the dogma that the poorest performing herds are late adopters and least likely to respond to an extension programme like this one. In fact, the results suggest that by targeting this group with InCalf we would be more likely to lift national performance.
While it might be disappointing that the national six week in-calf rate has not altered in the last ten years, rural providers can take confidence that use of the InCalf™ Farmer Action Group was found to be associated with a positive change in overall performance and this change was most apparent in the lower performing herds. Some of the commonly alleged factors for differences in performance (e.g. region and large herd size) were found not to be not-significant and should be disregarded when considering candidates for the InCalf™ Farmer Action Group. The longer term benefits of this programme still need to be evaluated to realise any effect beyond the two years of this study.

Acknowledgments

The National Herd Fertility Study is very grateful to the practices and technicians that have contributed so willingly and generously to support this study; Dr Andrew Weir at the Eltham District Veterinary Services, Dr Kate Foxcroft and Jason Gill at Riverside Vets, Dr Matt O’Sullivan and Jared Ovens at Oamaru Veterinary Services and Dr Steve Harness, Dr Geoff Plant, Dr Bryce Todd, Dr Katrina Roberts, Dr Katie Denholm, Dr Noelle Finlayson and technicians Laura Clausen, Cathy Yanez, Jo Niethammer at Anexa Animal Health, Waikato.

The National Herd Fertility Study is funded by New Zealand dairy farmers through DairyNZ Inc. (www.dairynz.co.nz 08004DAIRYNZ for enquiries) and the MAF Sustainable Farming Fund (grant number 08/008).

References

Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes 50, 179-211, 1991


Harris B. Multiple Trait Fertility Model for National Genetic Evaluation. Livestock Improvement, Private Bag 3016, Hamilton, New Zealand. 2005
