An epidemiological study of vaginal prolapse in ewes

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Summary
The incidence of vaginal prolapse among 188,169 mixed-age ewes on 113 farms in year 2000 and 136,054 mixed-age ewes on 88 farms in 2001 was 10.5 per 1000 mixed age ewe pregnancies.year^{-1}. Individual farm incidences varied from 0 to 59 per 1000 mixed age ewe pregnancies.year^{-1}. Multiple lambs *vs* singletons detected at ultrasound scanning, moderate to steep *vs* flat paddocks for lambing, gain in weight as opposed to loss of weight between start of mating and time of scanning at about 85 days, access to salt and feeding of swedes (*Brassica napus*) in the latter part of pregnancy were risk factors for the disease, while shearing within the second half of pregnancy was protective.

Introduction
About 0.5% - 1.0% of breeding ewes on New Zealand sheep farms experience an episode of vaginal prolapse annually but individual farms occasionally experience serious outbreaks affecting up to 10% of ewes.

Materials and Methods
This study involved 70 farms in the Hawkes Bay region and 70 farms in the Southland region of New Zealand. For each farm, data was collected for a wide range of animal factors and management procedures and descriptions of the farm's physical characteristics. Measurements were made at the whole farm level for factors such as breed of ewes and sires, and individually for performance of 200 randomly-selected mixed-age (MA) ewes on each farm. Overall flock fecundity was estimated from the proportions of empty, single and multiple bearing ewes recorded at ultrasound scanning.

Results
Valid data was obtained for 113 farms in year 2000 and 88 farms in year 2001. Flock sizes (MA ewes only) varied from 345 to 6000. In 2000 there were 2278 cases of vaginal prolapse recorded among 188,169 MA ewes and in 2001 there were 1121 cases recorded among 136,054 MA ewes. Individual farm incidence for both years varied from 0 to 59 per 1000 MA ewe pregnancies.year^{-1} (mean 15.6, median 13.9) in Southland and 0 to 39 (mean 7.5, median 5.4) in Hawkes Bay.

The outcome of interest for the farm level GLM analysis was incidence of disease in MA ewes (PREVMA1) transformed to normality (LOGPREV1 = Ln(PREVMA1/(1-PREVMA1)). Separate data sets for 113 farms in 2000 and 88 farms in 2001 were combined to form a data set of 201 farm experiences in which all 201 farms were

treated as independent observations. Results from the final GLM model are shown in Table 1. Table 2 shows farm numbers and ewe numbers for the different categories of predictor variables and crude incidences derived directly from the raw data. Factors identified as influencing the occurrence of the disease at the individual animal level are shown in Table 3.

Discussion

The farm-level analysis identified fecundity, breed, time of shearing, farm terrain, region and year as factors influencing the incidence of vaginal prolapse. Fecundity featured as an important predictor in both the farm level and individual animal analyses. Flocks made up of predominantly pure Perendale or Perendale cross ewes were at lower risk of disease than flocks with other breeds but caution is warranted for this particular finding since the number of flocks with Perendale make-up was relatively small (15) and only barely met the standards set for inclusion.

The implication from the farm-level and individual-animal analyses is that shearing in the three months leading up to mating is likely to be protective as is shearing in the second half of pregnancy. The influence of terrain featured both at the general farm and lambing paddock levels in the GLM and logistic models, respectively. It would seem that there is an opportunity to use this information in conjunction with scanning results and setstock for lambing, wherever possible, ewes scanned with twins and triplets on flat rather than sloping paddocks.

The logistic regression model focussed on risk of disease at the individual animal level and in addition to the terrain (risk positive) and shearing (risk sparing) effects identified, access to salt and feeding of swedes in the latter part of pregnancy, multiple lambs detected at scanning and gain in weight between start of mating and time of scanning were identified as risk factors for disease. Weight gain, as opposed to weight loss during the period between start of mating and scanning (mean = 95 days), was associated with an increased risk of disease. We suggest that this association may be explained by a nutritional effect on placental development and the placenta's subsequent effect on size of lambs at birth.

Any decisions to modify farming practices in the light of results from this study should take into account the likely extent of their effect on incidence. Vaginal prolapse is a relatively rare disease and introducing new management practices aimed at making it a little more rare may not be justified, particularly if those practices carry risks for other conditions e.g. shearing in winter and exposure. However where the disease is an ongoing problem then management changes in several influential areas may be warranted.

Table 1. Regression estimates for logit of farm level incidence of vaginal prolapse equation with farms treated as a random effect.

Independent variable	Coefficient	SE	P-value
Intercept	-5.7707	0.4018	<0.001
Proportion of ewes in the flock that were scanned with multiple lambs (PREVMSC)	1.9581	0.5518	0.001
Mainly Perendale or Perendale cross ewe flock (PEREWE)	-0.7230	0.2632	0.007
Shorn within 90 days prior to start of mating (PRETUP_90)	-0.2809	0.1296	0.033
Region (1 = Hawkes Bay, 0 = Southland)	-0.4570	0.1810	0.013
Farm terrain moderate/steep vs flat and steep (TERRTMX)	0.4503	0.1641	0.008
Year (0 = year 2000, 1 = year 2001)	-0.4661	0.1114	<0.001

Table 2. Predicted estimates of incidence per 1000 MA ewes.year $^{-1}$ with 95% confidence intervals in brackets for both levels of the predictor variables.

Variable	Category	Farms	Cases	Non-cases	Incidence (CI)	Crude mean Incidence
PEREWE	1	15	171	27,511	3.0 (1.6—5.2)	6.2
PEREWE	0	186	3,228	293,313	6.6 (5.5—7.9)	10.9
PRETUP_90	1	82	1,077	128,076	3.8 (2.6—5.4)	8.3
PRETUP_90	0	119	2,322	192,748	5.2 (3.8—7.1)	11.9
REGION	1	119	1,291	173,360	3.4 (2.3—5.0)	7.4
REGION	0	82	2,108	147,464	5.7 (4.0—8.0)	14.1
TERRTMX	1	144	2,354	228,313	5.7 (4.2—7.6)	10.2
TERRTMX	0	57	1,045	92,511	3.5 (2.3—5.2)	11.2
YEAR2000	1	88	1,121	134,933	3.4 (2.4—4.8)	8.2
YEAR2001	0	113	2,278	185,891	5.7 (4.2—7.9)	12.1

Table 3. Estimates of β coefficients (Coeff) standard errors (SE) and Odds ratio (OR) for farm management and animal factors influencing occurrence of vaginal prolapse and the modifying effect of pre-lamb shearing on ewes scanned with multiples and ewes with singles.

Variable	Coeff	SE	P-value	OR (95% CI)
Intercept	-5.5279	0.2561	<0.001	
Access to salt in late pregnancy	0.3332	0.1846	0.07	1.40 (0.97-2.00)
Multiple lambs detected at scanning	1.2324	0.2017	<0.001	3.43 (2.30-5.09)
Moderate to steep or a mix of flat and steep lambing paddocks terrain	0.3175	0.1737	0.07	1.37 (0.98-1.93)
Gain in weight between start of mating and scanning	0.2571	0.107	0.02	1.29 (1.05-1.59)
Swedes fed in latter part of pregnancy	0.3708	0.2027	0.07	1.45 (0.97-2.16)
Year	-0.7948	0.119	<0.001	0.45 (0.36-0.57)
Scenario 1. Ewes with singles and pre-lamb shorn				
Interaction effect	-1.3785	0.3419	<0.001	0.25 (0.13-0.49)
Scenario 2. Ewe with multiples and pre-lamb shorn				
Interaction effect	-0.4155	0.4789	0.386	0.66 (0.25-1.68)