**Application** Genetic selection on maternal breeding values could be used to reduce stillborn lambs and death from dystocia in maternal breeds.

**Introduction** Poor lamb survival is a major cause of productive inefficiency in the sheep sector. Survival rates vary dramatically between flock and system; however, it is estimated between 10-15% of all lambs born die every year before weaning in the UK and around the world (Dwyer et al, 2016). Investigating why these lambs die could help inform future breeding decisions.

**Materials and Methods** Lamb records (n= 58,851) for survival to 48 hours and 8 weeks, were collected over 7 years, across 22 farms and 7 different breed lines that make up the Innovis breeding program. Farmers recorded the cause of death. The most common identified causes of death; dystocia, starvation/mismothering/exposure or stillbirth, were analysed. Significance of fixed effects were assessed using general linear regression in GenStat (VSN International, 2022). Significant fixed effects were flock, lamb sex, lamb breed, lamb birth type and birthweight was a significant covariate. All significant 2-way interactions were fitted. Predicted means for each level of fixed effect were calculated and pair-wise t-tests assessed if differences were statistically significant. Heritability and maternal heritability were estimated by fitting a univariate animal model, with the above fixed effects and covariates, in ASReml, using 160,482 pedigree records over 17 generations.

**Results** Nine hundred and twenty lambs were assigned as being stillborn (1.5% of all lambs in the dataset), 568 lambs were assigned a cause of death as dystocia (0.9%) and 575 lambs were assigned starvation/mismothering or exposure as a cause of death (1.0%). There were significant differences between males and females for all causes of death with males more likely to die than females from all causes. For birth type there were significant differences between single born lambs, twin born lambs and lambs born in litters of 3 or more. There was a significant difference between all birth type categories for starvation/mismothering or exposure, with triplets most likely to die. There was a significant difference between single lambs and higher litter sizes for lambs dying from dystocia, with singles more likely to die. Triplets were significantly more likely to be stillborn than singles or twins. Cause of death heritabilities were low and not significantly different from zero (Table 1), but stillborn and dystocia had a significant maternal heritability.

Table 1

**Conclusions** To reduce deaths from dystocia and reduce stillborn lambs, maternal selection is required. Direct and maternal heritability for starvation/mismothering or exposure were not significant, so selective breeding is not likely to reduce these deaths; management decisions are likely to be more effective. These causes of death could be used in the future to increase accuracy of genetic evaluation of lamb survival traits.

**References** Dwyer, C.M., Conington, J., Corbiere, F., Holmoy, I.H., Muri, K., Nowak, R., Rooke, J., Vipond, J., Gautier, J.M., 2016. Invited review: Improving neonatal survival in small ruminants: Science into practice. Animal 10, 449–459.

VSN International, 2022. GenStat for Windows. VSN International, Hemel Hempstead, UK.

**Table 1:** Variance components (σ2a = additive variance, σ2m = maternal variance, σ2p = phenotypic variance) and heritability estimates (h2 = heritability, h2m = maternal heritability) for farmer assigned causes of death with standard errors.

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| Trait | σ2a | σ2m | σ2p | h2 | hm2 |
| Stillborn | 0.14±0.13 | 0.33±0.16 | 5.04±0.15 | 0.03±0.03 | 0.06±0.03 |
| Dystocia | 0.17±0.18 | 0.45±0.26 | 4.47±0.33 | 0.04±0.04 | 0.10±0.06 |
| Starvation/Mismothering or exposure | 0.15±0.19 | 0.09±0.16 | 4.65±0.20 | 0.03±0.04 | 0.02±0.03 |