**Truncated Mixture Models for Mortality and Survival up to Weaning of Calves**

Lucas López-Segovia[1], Guadalupe Gómez[1] and Anna Espinal[2]

[1] Department of Statistics and Operations Research, Technical University of Catalonia, ES
[2] Service of Statistics, Autonomous University of Barcelona, ES

The mortality of calves from birth to weaning reduce beef farm incomes and adds significantly to beef production costs [1]. The birth-weaning period for cattle extends from birth until the first 180 days of life and is the main goal in our investigation. Due to most calves survive 180 days, data present heavy censoring and a small percentage of mortality [2].
For such data, mixture cure models for the survival time of susceptible individuals, who may experience the event of interest, and nonsusceptible individuals who will never experience it, should be used. In this setup, the alive calves at 180 days, belong to the nonsusceptible population. However, standard mixture cure models assume that the event of interest could succeed in $[0, \infty]$, and that the event will be observed depending on how wide is the window of observation. In this paper we describe a procedure for estimating the proportion of survivors and the survival time up to the weaning of calves, assuming that the event of interest is defined within a bounded time interval, $[0, \tau]$.
The methodology extends the Proportional Hazards mixture cure models and the Accelerated Life mixture model for a truncated survival function. A set of covariates is introduced into the models either by means of the probability of death or by means of the survival function conditional to death. The estimates of the regression parameters are obtained by maximization of the full likelihood as well as via the EM algorithm. We present preliminary results for the survival of calves in the birth-weaning period using genetic and environmental factors as covariates.

## References

[1] Goyache F, Gutiérrez JP, Alvarez I, Fernández I, Royo LJ, Gómez E (2003) Genetic analysis of calf survival at different preweaning ages in beef cattle. Livest. Prod. Sci 83:13-20.

[2] Tarrés J, Casellas J, Piedrafita J (2005) Genetic and envieromental factors influencing mortality up to weaning of bruna dels pirineus beef calves in mountain areas. A survival analysis. Animal Science 83:543-551