Bayesian hierarchical models for longitudinal and time-to-event data: The case of Chronic Kidney Disease in children.

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Chronic Kidney Disease (CKD) is a progressive loss of renal function. The limitations that CKD produces in patients are huge, but in the case of children moreover affect to their growth. The variable used to quantify this loss is the Glomerular Filtration Rate (GFR), which allows to classify the illness in five stages in order of increasing severity. Patients in Stage 5 need dialysis or renal transplant.

The evolution of CKD patients is followed by subsequent hospital visits. This follow-up provides different types of information: longitudinal data on the evolution of GFR and survival time to get dialysis/transplant or recovery (only possible in a child's case). Data contain information from 168 children with CKD living in the Comunitat Valenciana who were diagnosed from 1st January 2005 until 31st December 2010 or before.

Joint models for longitudinal and time-to-event data are an extension of the marginal models that commonly are used for both types of data. One of the main benefits of those models is that both submodels can share common information. Specifically, we have used a Linear Mixed-effect submodel for the longitudinal data and a left-truncated competing risk submodel for the survival data. As a consequence of using this model under the Bayesian paradigm we have managed not only to explain properly the data, but also having great power in the prediction, something very important to help understanding the epidemiology of chronic diseases.

Keywords: Competing risk models. Joint modeling. Left-truncated data.