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# STATISTICS SEMINAR

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## Quantifying heterogeneity in acquisition of infectious diseases using frailty models

Frailty models are often used in survival analysis to model multivariate time-to-event data. In infectious disease epidemiology, frailty models have been proposed to model heterogeneity in the acquisition of infection and to accommodate for association in the occurrence of multiple infections.

More traditional frailty models in infectious disease epidemiology rely on the assumption of lifelong immunity after recovery (Farrington *et al.*, 2001). In Abrams and Hens (2014) refinements have been made to account for reinfections with the same pathogen. Farrington *et al.* (2012) and Unkel *et al.* (2014) introduced and applied time-varying shared frailty models to paired bivariate serological data. Abrams, Wienke and Hens (submitted) extended the proposed frailty methodology to account for age-dependency in individual heterogeneity through the use of age-dependent shared and correlated gamma frailty models extending also previous work by Hens *et al.* (2009). More recently, overdispersed frailty models have been investigated (Abrams *et al.*, in prep).

In this talk an overview of these developments will be given. The methodology will be illustrated using bivariate current status data on parvovirus B19 and varicella zoster virus, and Hepatitis A and B.

Friday, April 17, 2015 - 14h00 - Séminaire 12 (Building B31)  
Boulevard du Rectorat 7, 4000 Liege (Parking P15-16)

## REFERENCES

- Abrams, S. and Hens, N. (2015) Modeling individual heterogeneity in the acquisition of recurrent infections: an application to parvovirus B19. *Biostatistics* **16**, 129-142.
- Abrams, S., Wienke, A., Hens, N. Modelling time-varying heterogeneity in recurrent event time data: an application to serological data. *Submitted*.
- Abrams, S., Aerts, M., Molenberghs, G., Hens, N. Overdispersed frailty models for Type I interval censored data. *In preparation*.
- Farrington, C. P., M. N. Kanaan, and N. J. Gay (2001). Estimation of the basic reproduction number for infectious diseases from age-stratified serological survey data. *Applied Statistics*, **50**, 251-292.
- Farrington, C. P., S. Unkel, and K. Anaya-Izquierdo (2012). The relative frailty variance and shared frailty models. *JRSS B*, **74**, 1-24.
- Hens, N., A. Wienke, M. Aerts, and G. Molenberghs (2009). The correlated and shared gamma frailty model for bivariate current status data: An illustration for cross-sectional serological data. *Statistics in Medicine*, **27**, 2785-2800.
- Unkel, S., C. P. Farrington, H. J. Withaker, and R. Pebody (2014). Time varying frailty models and the estimation of heterogeneities in transmission of infectious diseases. *Applied Statistics*, **63**, 141-158.