

## **Dose-response analysis for variables with spike at zero - theoretical results and modelling procedures**

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In epidemiology and clinical research, a common goal is to estimate the effect of predictors on an outcome using appropriate regression models. Such predictors often consist of an amount of individuals with a value of zero while the distribution of the remaining ones is continuous (variables with a spike at zero). Examples in epidemiology are smoking or alcohol consumption. Since the risk for a certain disease may be substantially different between unexposed and exposed individuals, it is important to allow a separate estimate for the unexposed and a continuous function for those exposed.

In this presentation, we use logistic regression as the regression model. Some theoretical results on the theoretical odds ratio functions for selected univariate and bivariate distributions will be presented. A model fitting procedure how to include information of the zero values in the univariate and bivariate case using fractional polynomials will be given.

Data from case-control studies on laryngeal and breast cancer will be used to illustrate the method.

### References:

Lorenz E, Jenkner C, Sauerbrei W, Becher H (2015) Dose-response modelling for bivariate covariables with and without a 'Spike' at Zero: Theory and applications to binary outcomes. *Statistica Neerlandica* published online: 16 MAR 2015 | DOI: 10.1111

Becher H, Lorenz E, Royston P, Sauerbrei W (2012) Analysing covariates with spike at zero: a modified FP procedure and conceptual issues. *Biometrical Journal* 54: 686-700.