

**GENERALIZED ADDITIVE MODELS FOR LOCATION, SCALE AND
SHAPE IN AN ANALYSIS OF HOSPITAL PROCEDURES COSTS
FINANCED BY A HEALTH INSURANCE COMPANY**

Rafaela de Sousa KIENEN¹
Cesar Augusto TACONELI²

- **ABSTRACT:** *Statistical modeling of costs associated with medical and hospital procedures is a very complex task, being common to find heavily skewed distributions, multiple associated factors, nonlinear effects and heterogeneous variances. Analysis of such data requires the use of statistical methods that properly handle data with such features. In this context, this work presents an application of Generalized Additive Model application for Location, Scale and Shape (GAMLSS) in the analysis of child-birth costs, financed by a health insurance company, in Curitiba-PR, 2013. It was possible to consider a wider variety of distributions for the random component, to incorporate random effects and jointly modeling location and dispersion parameters using covariates. It was found that Box-Cox power exponential (BCPE) and Skew-T type 3 (ST3) distributions provided better fits. For models fitted with these two distributions, factors such as child-birth type, place of hospitalization and accommodation type shown to be related to the proceedings costs. The doctor responsible for child-birth was included to the models by random effects, allowing identifying their contribution to the final cost and assessing the correlation between the effects produced by the two distributions. The effects of medical and place of hospitalization were also considered in modeling the costs dispersion, verifying that such specification contributed to a better fit.*
- **KEYWORDS:** *Child-birth costs; generalized additive models for location; scale and shape; random effects; health insurance.*

¹ Universidade Federal do Paraná - UFPR, Setor de Ciências Exatas, Curso de Estatística, Caixa Postal 19.081, CEP: 81.531-990, Curitiba, Paraná, Brasil. Email: rafaela_kienen@hotmail.com

² Universidade Federal do Paraná, Setor de Ciências Exatas, Departamento de Estatística, Caixa Postal 19.081, CEP: 81.531-990, Curitiba, Paraná, Brasil. Email: cetacneli@gmail.com