Generalized additive models to nomial responses using bivariate Kernel: an solution to spatial analysis.

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The spatial distribution of disease risk has always been a concern in Epidemiology. Particularly, in the last two decades, several techniques of spatial analysis for epidemiological data have been developed to estimate the variation of risk in space. However, several studies based on scales or multinomal response still use logistic regression models for data analysis without incorporating spatial effects. This is partially due to the reduced number of techniques and computational tools which allow treating adequately multinomial responses occurring in epidemiological data within the spatial setting. This work aims to contribute to overcoming this limitation. To do this, when the response of a case-control study is multinominal, the authors define the spatial risk[1] and present how to obtain, analyse and map it, including acquaintance of the estimates statistical significance. To obtain the risk is presented an algorithm to estimate GAM when the response is multinomial and the non-parametric function, to study the space, is estimated as a bidimensional kernel. The significance analysis of the estimated spatial risk is obted trough a simulation method[2]. All programming was made in software R2.7 and the maps were built on ArcMap 9.2. Data from a population-based case-control study of occupational accidents in a Brazilian city[3] were adjusted with the response variable classified in three categories: serious cases, mild cases and controls. Along the spatial analysis, other informations about the occupation and the employee were included. The analysis has found areas of significant increased relative risk and protection for occupational accidents that varied depending on the level of comparison. Some areas had twice the risk compared to the average of the region studied when considering serious accident. In parametric variables studied, different risk and protection factors were found for the two levels of the cases. This work brings the complete way to analyze data from case-control studies with multinomial response where the spatial risk has to be analyzed.

REFERENCES
1. Bithell J. An application of density estimation to geographical epidemiology. Statistics in Medicine 1990;9:691-701.
2. Kelsall JE,.Diggle PJ. Spatial variation in risk of disease: a nonparametric binary regression approach. Applied Statistics 1998;47:559-73.
3. Stephan C. Distribuição do risco de acidente do trabalho entre trabalhadores precarizados de Piracicaba. - Campinas, SP : [s.n.], 2008.