

# MATHEMATIK-ARBEITSPAPIERE

A: MATHEMATISCHE FORSCHUNGSPAPIERE

ESTIMATION OF NONPARAMETRIC RISK FUNCTIONS  
IN MATCHED CASE-CONTROL STUDIES

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# Estimation of nonparametric risk functions in matched case-control studies

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## Abstract

In epidemiological studies one is interested in investigating the probability of disease depending on risk factors and in particular in detecting interactions of risk factors. Within the setting of parametric logistic regression interactions can be modeled only in a clumsy and limited way. Modeling the risk function nonparametrically, estimating it e.g. by a smoothing (thin plate) spline is attractive as a more explorative approach. For prospective studies this amounts to smoothing within the framework and distributional assumptions of generalized regression models (for binary observations). Case-control studies as retrospective studies with exposure to risk factors being observed do not immediately fit into this setting. In the special case of one-to-one matched studies however there is an appropriate likelihood again within the range of generalized models. Inferences will be illustrated using simulated and real data.

**Keywords:** nonparametric risk functions, conditional likelihood, general regression model, splines