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Generalised Additive Models in Demographic Event History Analysis: A Birth Event Case Study

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ABSTRACT

Discrete-time event history analysis is widely used in fertility research, especially when birth dates are imprecisely recorded. However, conventional specifications of continuous covariates using functions such as categories, polynomials, or piecewise functions can limit flexibility and precision. This study applies Generalised Additive Models (GAM) to discrete-time event history analysis of birth events, assessing their advantages over conventional methods. Using the Household Longitudinal Study consisting of 22,020 women, we model parity specific birth progressions with covariates including age, year, time since last birth, education, and country of birth. Logistic GAM with smooth terms and interactions are selected using the Bayesian Information Criterion. GAM markedly improve model fit and reveal nuanced fertility patterns such as bimodal age effects and education-related postponement that is not captured by traditional approaches. Their flexibility and interpretability make GAM a valuable tool for analysing complex fertility dynamics in longitudinal data.