

Rodrigues, Josemar; Cordeiro, Gauss M.; Cancho, Vicente G.; Balakrishnan, N.
Relaxed Poisson cure rate models. (English) Zbl 1381.62281
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Summary: The purpose of this article is to make the standard promotion cure rate model [A. Yu. Yakovlev and A. D. Tsodikov, Stochastic models of tumor latency and their biostatistical applications. Singapore: World Scientific Publishing (1996; Zbl 0919.92024)] more flexible by assuming that the number of lesions or altered cells after a treatment follows a fractional Poisson distribution [N. Laskin, Commun. Nonlinear Sci. Numer. Simul. 8, No. 3–4, 201–213 (2003; Zbl 1025.35029)]. It is proved that the well-known Mittag-Leffler relaxation function [M. N. Berberan-Santos, J. Math. Chem. 38, No. 4, 629–635 (2005; Zbl 1101.33015)] is a simple way to obtain a new cure rate model that is a compromise between the promotion and geometric cure rate models allowing for superdispersion. So, the relaxed cure rate model developed here can be considered as a natural and less restrictive extension of the popular Poisson cure rate model at the cost of an additional parameter, but a competitor to negative-binomial cure rate models [the first author et al., J. Stat. Plann. Inference 139, No. 10, 3605–3611 (2009; Zbl 1173.62074)]. Some mathematical properties of a proper relaxed Poisson density are explored. A simulation study and an illustration of the proposed cure rate model from the Bayesian point of view are finally presented.

MSC:

62P10 Applications of statistics to biology and medical sciences; meta analysis Cited in 2 Documents
62F15 Bayesian inference

Keywords:

Bayesian inference; fractional Poisson distribution; geometric cure rate model; Mittag-Leffler relaxation function; Poisson cure rate model; relaxed Poisson cure rate model

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