Nonparametric estimation of specific occurrence/exposure rate in risk and survival analysis.


The authors study a standard competing risk situation with the possibility of censoring due to (1) withdrawal or (2) end of study. They start from scratch rather than from standard survival analysis formalism; in particular, the basic survival distribution function is given as a mixture \( \pi F_1(t) + (1 - \pi)F_2(t) \) of distribution functions \( F_i \) of lifetimes of those dying of each cause. The authors derive a nonparametric estimator of what they call the specific occurrence exposure rate \( \pi M / \int_{[0,M]} F(t) \, dt \), which is claimed to have an interpretation as an “exposure rate of cancer”, being a practical modification of \( \pi / \int_0^\infty t \, dF(t) \), which carries the interpretation of (probability of death due to cancer)/(average life span). Asymptotic distribution results for this estimator are derived and bootstrapping is discussed as a way to estimate the asymptotic variance.

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