



INTISARI

MODEL RISIKO BERSAING MENGGUNAKAN PENDEKATAN *CAUSE-SPECIFIC HAZARD*

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Analisis risiko bersaing memperluas analisis survival agar diaplikasikan dalam data waktu antar kejadian pertama *time-to-first-event* dan tipe kejadian. Penelitian ini bertujuan untuk mengkaji metode statistika untuk analisis risiko bersaing dan multistatus (model Markov waktu nonhomogen) berdasar *cause-specific hazards* (CSH). Pendekatan CSH mendasari analisis secara nonparametrik yaitu estimator Nelson-Aalen untuk fungsi hazard kumulatif, estimator Aalen-Johansen untuk peluang transisi (matriks peluang transisi). Model regresi semi-parametrik untuk data risiko bersaing juga digunakan. Regresi Cox hazard proporsional digunakan untuk mengestimasi pengaruh kovariat. Model regresi ini juga menggunakan CSH. Kita memberikan studi kasus berupa data risiko bersaing kasus HIV di kota Amsterdam. Kejadian bersaing yang diperhitungkan adalah kemunculan pertama kejadian AIDS dan kemunculan pertama *Syncytium-Inducing* (SI) sebagai dua kejadian yang bersaing. Adanya delesi gen *ccr5* (kelainan gen yang menyebabkan resistensi terhadap HIV) digunakan sebagai kovariat. Analisis risiko yang bersaing menggunakan sebagai kuantitas statistik CSH secara simultan memodelkan semua fungsi hazard untuk semua risiko dan memberikan interpretasi yang lebih alami.

Kata kunci: analisis survival, risiko bersaing, *cause-specific hazards*, model multistatus.



ABSTRACT

COMPETING RISK MODELS USING CAUSE-SPECIFIC HAZARD

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Competing risks analysis extends survival analysis that applies to time-to-first-event data and multiple first event types (different endpoints). This study aims to review statistical methods for the competing risk analysis and multi-state models (nonhomogeneous time Markov model) based on cause-specific hazards (CSHs). The CSH approach underlies the nonparametric analysis, the Nelson-Aalen estimator for the cumulative hazard function and the Aalen-Johansen estimator for the transition probability matrix. Semi-parametric regression models for competing risk data were also used. Regression modeling, the Cox proportional hazard regression model for estimating the effect of covariates, uses CSH. We are using a case study in the form of competing risk data for HIV cases of Amsterdam cohort. The competing events that were accounted for were the first occurrence of AIDS and the first occurrence of Syncytium-inducing (SI) as two competing events. The presence of a deletion of the CCR5-32 gene that causes resistance to HIV replication was used as a covariate. We state that competing risk analysis uses CSHs as a statistical quantity that simultaneously models all hazard functions of all risks provides a more natural interpretation.

Kata kunci: survival analysis, competing risks analysis, cause-specific hazards, multi-state model.