ATELIER « ANALYSE DES DURÉES DE VIE ET DES DONNÉES HISTORIQUES D'ÉVÉNEMENTS »
16–19 MAI 2011

WORKSHOP ON "ANALYSIS OF SURVIVAL AND EVENT HISTORY DATA"
MAY 16–19, 2011

Measurement error correction for survival data analysis with time-varying covariates

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Nutritional and environmental epidemiologists are often interested in estimating the prospective effect of time-varying exposure variables such as the cumulative exposure variable – the sum of all exposures up to the present time – or the cumulatively updated average exposures – the running average of all exposures up to the present time – in relation to chronic disease endpoints such as cancer and cardiovascular disease incidence and mortality. By re-calibrating the measurement error model within each risk set, a risk set regression calibration (RRC) method is proposed for this setting. An algorithm for a bias-corrected point estimate of the relative risk using an RRC approach is developed, followed by the derivation of an estimator of its variance. Emphasis is on methods applicable to the main study/external validation study design, which is standard in nutritional and environmental epidemiology. Limitations of the current validation study designs are discussed and partial solutions to these limitations are proposed. Simulation studies under several realistic assumptions about the error model were conducted, which demonstrated the validity and efficiency of this method in finite samples. The method is applied to a study of long-term vitamin E and calcium intake in relation to colorectal cancer risk in Harvard's Health Professionals Follow-up Study and to a study of the effects of chronic exposure to constituents of air pollution on cardiovascular mortality in the Nurses' Health Study.

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