Department of Decision Sciences

Statistics Seminar

Model-based nonparametric estimation of absolute disease risk from case-control studies

Fabio Rigat
Novartis Vaccines Italia

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Abstract

Case-control studies are ubiquitous tools for biomarker discovery, paving the way for prospective clinical trials assessing therapeutic and prophylactic clinical interventions targeting the discovered biomarkers. The primary endpoints of case-control studies traditionally use relative measures of disease risk, thereby estimating differences in biomarker distributions between the case and control groups. This approach does not attempt to contextualize the results of a case-control study within its epidemiological background. Absolute disease risk measures estimated from both case-control data and from disease incidence data provide this link, allowing for the quantification of the expected effects of biomarker-targeting interventions on the fraction of the population at risk having similar clinical profiles to those observed in the case-control study. This talk illustrates the theory and application of a statistical model leveraging on both parametric and nonparametric components of a mixture biomarker distribution to produce optimally smoothed absolute risk curves of Group B Streptococcus (GBS) infection in newborns. This mixture approach builds on well-known Bayesian nonparametric theory, by taking an empirical Bayes perspective. The optimally smoothed absolute disease risk curve shows that maternal antibody directed against the GBS capsule mediate protection of the newborn against early onset disease infection, thereby informing clinical development decision making.

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Via Röntgen 1 - 20136Milano

Tel. 02 5836.5632
Fax 02 5836.5630