Nonparametric estimation of pregnancy outcome probabilities using a stabilized Aalen-Johansen estimator

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Estimating pregnancy outcome probabilities based on observational cohorts has to account for both left-truncation, because the time scale is gestational age, and for competing risks, because, e.g., an elective termination may be precluded by a spontaneous abortion. The applied aim of this work was to investigate the impact of statin in drug exposed pregnancies using data from a Teratology Information Service. Using the standard Aalen-Johansen estimator of the cumulative event probabilities suggested the medically implausible finding that statin exposure decreased the probability of elective termination and led to more live births. The reason was an early elective termination in a very small risk set, leading to unstable estimation which propagated over the whole time span. We suggest a stabilized Aalen-Johansen estimator which discards contributions from too small risk sets. The new estimator leads to a more meaningful analysis of the statin data. We also show that the new estimator enjoys the same asymptotic properties as the original Aalen-Johansen estimator - if one uses a little information from the future. We discuss why the present conditioning on the future does not compromise our analyses, investigate small sample properties in extensive simulations and finally outline extensions to more general right-censored and/or left-truncated multistate models.
This is joint work with Sarah Friedrich, Arthur Allignol and Ursula Winterfeld.