Survival Analysis - Winter 2019

Assignment 4

The assignment is due Wednesday April 3rd at **2:10pm**. In Q1-2 we are still using the `veteran` dataset, while questions Q3-5 are based on the `transplant` dataset (815 patients on a liver transplant waiting list).

1. Age could be added to the model also as a time-dependent covariate, to take into account that the patients are aging during the follow-up. Do this using the `tt` argument of the `coxph` function (please show your function call). What happened to the age effect estimate compared to the model with the fixed baseline age variable? Explain why.

2. (a) Going back to the model without age or other prognostic factors, one way to avoid assuming proportionality of the treatment effect over the entire follow-up period would be to estimate separate treatment effects for early and later parts of the follow-up period. Fit a Cox model that allows for separate treatment effects before and after 100 days of follow-up. Construct the required time-dependent covariates by using the `tt` argument of the `coxph` function (please show your `coxph` function call). Comment on the results compared to the Cox model that assumed a constant treatment effect. Do you see any problems in looking for different treatment effects over the follow-up period, especially if we chose the 100-day cutoff based on seeing the non-parametric survival curves?

   (b) Specify (algebraically) the hazard model you fitted in Q2(a).

3. From the transplant data, estimate (i) the probability of receiving transplant using the Kaplan-Meier method and (ii) the cumulative incidence of receiving transplant using the non-parametric cumulative incidence estimator. Present the results as curves over time. Which method would you prefer and why?

4. Fit appropriate Cox and Fine & Gray models adjusted for age, sex, ABO blood group and year, and use these to calculate the cumulative incidence curves for receiving transplant and death at the average covariate values. How do the results compare between the models?

5. Use the fitted Cox and Fine & Gray models adjusted to calculate individual-level one-year cumulative incidences of receiving the transplant. Present these in a scatterplot. How do the results compare between the models?

Olli Saarela, Dalla Lana School of Public Health, 155 College Street, 6th floor, Toronto, Ontario M5T 3M7, Canada. E-mail: `olli.saarela@utoronto.ca`