Visualizing covariates in proportional hazards model using R

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Consider an example where the hazard of coronary heart disease (CHD) is modeled by Cox's proportional hazards model with covariates cholesterol ratio, blood pressure (mmHg), body mass index (BMI, kg/m^2) and smoking (0/1). The estimated hazard ratios and their 95% confidence intervals are: cholesterol ratio 1.237 (1.200,1275), blood pressure 1.016 (1.012,1.021), BMI 1.015 (0.999,1.032), smoking 1.773 (1.572,1.999). We are interested in assessing the importance of these covariates in the population, e.g. answer questions such as "is smoking more serious risk factor of CHD than overweight in the population level?" The answer depends not only on the model coefficients and their statistical significance but also on the prevalence of smoking and overweight in the population.

We present a graphical method that visualizes the relative importance of covariates in a proportional hazards model. The key idea is to rank the covariates and plot the relative hazard as a function of ranks scaled to interval $[0, 1]$. This allows plotting of covariates measured in different units in the same graph. The reference hazard for relative hazards can be fixed to correspond to the cohort medians or some predefined reference values, e.g. BMI value 25. The method can be also utilized when comparing models. For instance, we may visualize the effect of taking logarithms of the covariates.

The visualization is implemented using R. An illustration is shown below.