Plan for this lecture

- A few expressions for the relative risk regression
  - specification of the situation
  - hazard rate and intensity process
  - partial likelihood
- Cox regression as profile likelihood

Relative risk regression

- Situation:
  - n individuals
  - individual i has covariate vector $x_i(t)$
  - individual i has hazard rate and intensity process

$$\begin{aligned}\alpha(t|x_i(t)) &= \alpha_0(t)r(\beta, x_i(t)) \\ \lambda_i(t) &= Y_i(t)\alpha_0(t)r(\beta, x_i(t))\end{aligned}$$

  - $N_i(t)$, $Y_i(t)$, $N_\bullet(t)$, $Y_\bullet(t)$, $\lambda_\bullet(t)$

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- Partial likelihood

$$L(\beta) = \prod_j \left[\frac{r(\beta, x_{i_j}(T_j))}{\sum_{l=1}^n Y_l(T_j) r(\beta, x_l(T_j))} \right]$$

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- For Cox regression models:

$$r(\beta, x_i(t)) = \exp\{\beta^T x_i(t)\}$$