Exponential Model

$\boxed{\beta=0 \quad \gamma=1}$

$$Y=\begin{cases} 0 & \text{cured} \\ 1 & \text{not cured} \end{cases}$$

T: survival time starting from study entry.

Model: $P(T>t \mid Y=1) = e^{-\lambda t}$

$$P(T>t \mid Y=0, a) = \frac{S_0(a+t)}{S_0(a)}$$

age at entry

$$P(Y=0)=p, \quad P(Y=1)=1-p.$$

Data: (t, δ, a, y)

The observation on Y could be missing.

The observation on Y never equals 0.

(1) If $y=1$ (died due to the disease, or relapsed), the likelihood is

$$L = (1-p)\cdot[\lambda]^{\delta} e^{-\lambda t}$$

(2) If $y=\cdot$, the likelihood is

$$L = \left[p\frac{S_0(a+t)}{S_0(t)} + (1-p)\, e^{-\lambda t}\right]^{1-\delta} \cdot \left[p\frac{f_0(a+t)}{S_0(a)} + (1-p)\,\lambda e^{-\lambda t}\right]^{\delta}.$$

Farewell model:

Replace $\frac{S_0(a+t)}{S_0(a)}$ by 1

Replace $\frac{f_0(a+t)}{S_0(a)}$ by 0