1. Compute the survival function for the general population : $S_0(t)$. by month.

2. Compute the density function for the general population $f_0(t)$.

3. Conditional survival function and density function

$$S^*(t; t_0) = P(T > t_0 + t \mid T > t_0)$$

$$= \frac{S_0(t_0+t)}{S_0(t_0)}$$

$$f^*(t; t_0) = \frac{f(t_0+t)}{S_0(t_0)}$$

Known

Model:

$$S(t;t_0) = \pi\, S^*(t;t_0) + (1-\pi)\, S_1(t)$$

where $S_1(t) = e^{-(\lambda t)^\gamma}$ (Weibull)

$$\pi = \frac{1}{1+e^{\alpha+\beta x}} \qquad x: \text{\# lesions}$$

The data on ith patient are

$(t_i, \delta_i, x_i, a_i)$

where t_i is the survival time counted from enrollment and a_i is the age at enrollment.

The likelihood function for the ith individual:

$$L_i = \left[\frac{1}{1+e^{\alpha+\beta x_i}}\,\frac{S_0(a_i+t_i)}{S_0(a_i)} + \frac{e^{\alpha+\beta x_i}}{1+e^{\beta x_i}}\, e^{-(\lambda t_i)^\gamma}\right]^{1-\delta_i}$$

$$\cdot \left[\frac{1}{1+e^{\alpha+\beta x_i}}\,\frac{f(a_i+t_i)}{S_0(a_i)} + \frac{e^{\alpha+\beta x_i}}{1+e^{\beta x_i}}\cdot \lambda\gamma(\lambda t_i)^{\gamma-1} e^{-(\lambda t_i)^\gamma}\right]^{\delta_i}$$