10-Minute In-Class Quiz 3: Survival Analysis (Chapters 8-9)

Instructions

- You have **10 minutes** to complete this quiz.
- Answer all questions *concisely*.
- Show all relevant calculations where applicable.

Question 1 (5 points) – Recurrent Events

Figure 1 below shows the follow-up of six patients for repeated infections.

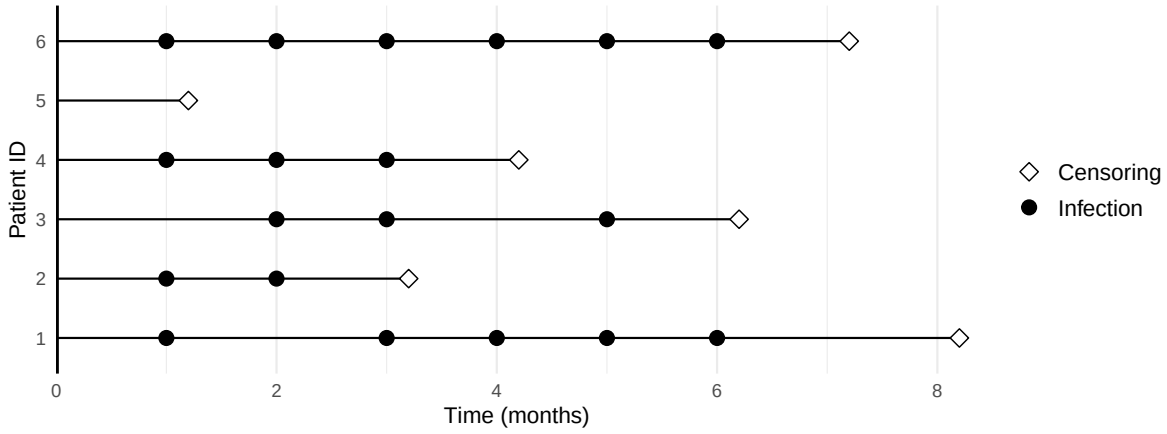

Figure 1: Follow-up of six patients for repeated infections.

- Calculate the (Nelsen–Aalen-type) estimates of the **average number of infections per patient by month 2, 4, and 6**.

- Why is the following arithmetic biased:

$$\frac{\text{Total number of black dots by month } 2, 4, 6}{6 \text{ subjects}}$$

Question 2 (5 points) – Mean Model

Let $N^*(t)$ denote the average number of recurrent events by time t (such as estimated in Question 1). Let $Z = 1, 0$ denote treatment and control groups, respectively. Under the multiplicative mean model:

$$E\{N^*(t) \mid Z\} = \exp(\beta Z)\mu_0(t),$$

- What is the mean function in each group, i.e., $E\{N^*(t) \mid Z = z\}$ for $z = 1, 0$?

- Suppose $\widehat{\beta} = \log(0.8)$, interpret the treatment effect.