

B5440 – Exercise 5

Exercises

Adjustment and collapsibility

1. Let X be binary taking values 0 or 1, and Z be an independent, continuous random variable.
 - a. Suppose the true model for the hazard is additive:

$$\alpha(t|X, Z) = \beta_0(t) + X\beta_1(t) + Z\beta_2(t)$$

but we fit the model

$$\alpha(t|X) = \eta_0(t) + X\eta_1(t).$$

Derive an expression for $\eta_1(t)$ in terms of the β and the distribution of Z .

- b. Suppose instead that the true model is multiplicative

$$\alpha(t|X, Z) = \alpha_0(t) \exp(X\gamma_1 + Z\gamma_2),$$

but again we fit the model omitting the covariate Z :

$$\alpha(t|X, Z) = \alpha_0(t) \exp(X\theta_1).$$

Derive the relationship between θ_1 and the other parameters and the distribution of Z .

- c. For a fixed t , suppose the model for the cumulative incidence is

$$g(P(T < t|X, Z)) = \beta_0 + \beta_1 X + \beta_2 Z$$

for some link function g . What can you say about the problem of omitting the variable Z for different choices of the link function (e.g., identity, log, logit)?