Program L5 in-class

- **Cox's proportional hazards model**
  - Online lecture follow-up
  - Review questions
  - Exercises

Review question

Why can't e.g. logistic or linear regression be used instead of Cox regression in analysis of survival data?

Review question

Why is the Cox model said to be semi-parametric?

Review question

Which are the assumptions of Cox regression?

What does each assumption mean?

Exercise 8.9

a) Using the data set in section 1.6, test the hypothesis that the distributions of the times to staphylococcus infection are the same in the two disinfectant groups.

Note: Investigate the relationship between time to staphylococcus infection and type of disinfectant, not only focusing on the hypothesis testing.

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Example: infection in burns

In section 1.6 a study is described to evaluate a protocol change in disinfectant practice in a large midwestern university medical center.

Control of infection is the primary concern for the 154 patients entered into the burn unit with varying degrees of burns.

The outcome variable is the time until infection from admission to the unit. Censoring variables are discharge from the hospital without an infection or death without an infection.

84 patients were in a group which had a body-cleansing method (disinfectant: chlorhexidine) and 70 patients received the routine bathing care method (disinfectant: povidone-iodine).

Example: infection in burns

Variables:

Trt = treatment (0=routine bathing, 1=body cleansing)

TimeStaph = Time to staphylococcus infection (days)

Staph = Staphylococcus indicator (1=infection, 0=no inf.)

Exercise 8.9

b) Test the hypothesis that the distributions of the times to staphylococcus infection are the same in the two disinfectant groups adjusting for the total area burned (*area*). Compare your results to those in part a.

Again: investigate the relationship, not only focusing on the statistical significance.

Exercise 8.9

c) Also available in the data set is information on other factors that may be associated with the timing of staphylococcus infection. Some of these factors are gender, race, total surface area burned, and type of burn (chemical, scald, electrical, flame). For each factor create a set of fixed-time covariates. Test the hypothesis that the times to staphylococcus infection are the same for the two disinfectant groups using a model which adjusts for each of these factors.

Example: infection in burns

Possible confounders*:*

Area (percentage burned, % of total surface area)

BurnSite (head, buttock, trunk, etc. – 6 indicators)

BurnType (1=chemical, 2=scald, 3=electric, 4=flame)

Gender (0=male, 1=female)

Race (0=nonwhite, 1=white)

Exercise 8.9 d)

d) Since one is primarily interested in comparing the two bathing solutions (trt), interest will center upon building a model with the view of testing that particular comparison adjusting for the other non-controllable factors in part (c).

Using a forward selection approach, build such a model using the *p*-value approach. Based on the final model, test the hypothesis of primary interest.

Exercise 9.8

In the burn study described in section 1.6 and as a follow-up to Exercises 8.2 and 8.9 ….

a) Introduce a time-dependent covariate that reflects the time at which a wound was excised. Investigate the effects of the timing of wound excision on the time until infection occurs.

b) Introduce another time-dependent covariate that reflects the time when a prophylactic antibiotic treatment was administered. Investigate the effect of having a prophylactic antibiotic treatment on the time until infection occurs.