HRM 759: Survival Analysis in Health Research

September-December 2023

Course Coordinator

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Course Instructors

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Course Description

This course provides an introduction to the core concepts and methods for analyzing the time-to-event (survival) data obtained from either epidemiological studies or randomized controlled trials. The contents include: **Kaplan-Meier life table and curve, Log-rank test to compare two or more groups, Cox's proportional hazards regression model, parametric regression models, sample size calculation, and some advanced topics including time-dependent covariates, recurrent events, completing risks, and multi-state model.** Students will also learn how to manipulate and analyze the survival data using **SAS** and interpret the SAS output in this course. However, they are free to use any statistical software to complete the analysis of their final report.

Course Objectives

1. Recognize the characteristics of survival data, e.g. **censoring and truncation**.
2. Define and understand the relationship between the **survival function, hazard function, relative hazard, and cumulative hazard**
3. Understand the assumptions for the method chosen to analyze the data
4. Determine the proper method to be used in analyzing time-to-event data
5. Perform and interpret **Kaplan-Meier analysis and log-rank test**
6. Analyze survival data and interpret results using **Cox proportional hazards model**
7. Assess models for fulfillment of proportional hazards using graphical and other methods
8. Assess the goodness of model fit

9 Use **extended Cox model** to incorporate time-dependent covariates in the analysis and interpret the coefficients
10 Understand competing risks and recurrent event survival analysis
11 Perform survival analysis using SAS
12 Interpret outputs from PHREG and LIFEREG procedures in SAS,
13 Evaluate the quality of analysis and reporting of published papers
14 Formulate research questions involving survival data as regression problems
15 Compute sample size for studies involving survival analysis
16 Understand multi-state model in survival analysis
17 Handle missing data in survival analysis

Course Format (3 hrs/Week)

The course is designed to be taught in a lecture-based format with a problem-based discussion component. Required readings for each class will be posted on the Avenue one week before the class. Each week there will be an assignment for discussion to help students better understand the concept and application of a particular method.

Pre-requisites
HRM 723 (Regression Analysis) or by permission of instructor. N.B. HRM 721 is recommended.

Reference Books

1. Allison PD (2010), Survival Analysis Using SAS: A Practical Guide (Second Edition), SAS Institute Inc.

2. Kleinbaum DG, and Klein M (2012), Survival Analysis- A Self-Learning Text, Third Edition, Springer.

3. Hosmer DW Jr, Lemeshow S, May S (2008) Applied Survival Analysis: Regression Modeling of Time to Event Data (2nd edition). John Wiley & Sons, Inc.

Evaluation Methods

The course will be evaluated through three components:

1. Student's attendance and participation (10%)

2. Hand-in assignments (25%)
    - Assignment will be posted on Avenue on Wednesday.

- Assignment must be submitted on the following Monday before 12 noon.

3. Hand-in mini report (15%)
    - Mini report topic and requirement will be posted on Avenue three weeks before the due date.

4. Final project presentation (5%)
    - Each student is required to present his/her final project for 10-15 minutes.

5. Final project (45%)
    - Due on Dec. 12, 2022.
    - For the final project, students are required to analyze a real-world data of their own choice, which will be the major basis of the course evaluation. Students must look for a real-world dataset as soon as possible.
    - Students are encouraged to try all suitable methods covered in the course to analyze the dataset but report the results from the most appropriate method in the final report.
    - The final project report should be at most 12 double-spaced pages plus the final computer output.