HRM 759: Survival Analysis in Health Research

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Course Coordinator

Jinhui Ma, PhD
Department of Health Research Methods, Evidence, and Impact
McMaster University
Tel: 905-525-9140 ext. 21876
Email: maj26@mcmaster.ca
Address: MIP 109A, 175 Longwood Rd. S. Hamilton, ON, L8P 0A1, Canada

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 content includes: 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, multi-state models, and machine learning for survival analysis. 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 for 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 the phreg and lifereg procedures in SAS,
13 Evaluate the quality of survival analyses conducted in published research papers

14 Formulate research questions involving survival data as regression problems
15 Compute sample size for studies involving survival analysis
16 Understand multi-state models and machine learning 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 concepts and apply appropriate methods.

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 (15%)

2. Two hand-in assignments (15% each)
    - Assignment will be posted on Avenue three weeks before the due date.

3. Final project (55%)
    - Due one week after the final presentation.
    - For the final project, students are required to conduct analysis on a dataset of their own choice which will be a major basis for course evaluation. Students must look for a suitable dataset as soon as possible.

- Students are encouraged to apply most of the methods discussed in class to the dataset but report the results from the most appropriate method in the final report.
- The final project consists of two parts: a hand-in report of at most 10-12 double-spaced pages plus the final computer output (40%), and a class presentation of 10-15 minutes (15%).