1 General Information on the Course

Course Number
EPID-823

Title
Advanced Biostatistics

Instructors

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dongsheng Tu</td>
<td>Clinical Trials Group</td>
<td>77830</td>
<td><a href="mailto:dtu@ctg.queensu.ca">dtu@ctg.queensu.ca</a></td>
</tr>
<tr>
<td>Patti Groome</td>
<td>Cancer Care &amp; Epidemiology</td>
<td>78512</td>
<td><a href="mailto:patti.groome@krcc.on.ca">patti.groome@krcc.on.ca</a></td>
</tr>
<tr>
<td>Will King</td>
<td>211 Carruthers Hall</td>
<td>74735</td>
<td><a href="mailto:kingw@queensu.ca">kingw@queensu.ca</a></td>
</tr>
<tr>
<td>Michael McIsaac</td>
<td>209 Carruthers Hall</td>
<td>77460</td>
<td><a href="mailto:mcisaacm@queensu.ca">mcisaacm@queensu.ca</a></td>
</tr>
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Time and Location of Classes
Tuesday 1:30 – 4:30 pm; Carruthers Hall 311

Pre-requisites or Co-requisites
EPID-822

Instructional Objectives
At the end of the course, students should be able to
• understand the concepts, assumptions, theory and logic involved some complex statistical methods used in epidemiology
• perform multivariable and multivariate analyses and develop appropriate statistical models for different types of data.
• use the developed models to interpret the results and draw conclusions.

Course Content
Topics include: Analysis of longitudinal and survival data using various regression models; Techniques and strategies for regression modeling; Novel analytic approaches including quantile regression and instrumental variables approach; multivariate analysis methods including discriminant analysis, principal components and factor analysis.
Enrolment Limit
No more than 20

Target Group
Graduate students from the Department of Public Health Sciences, and other departments in and outside the faculty of medicine, who need advanced biostatistics for their study projects.

Principal Mode of Instruction
Lectures or seminars (3 hours/week); or modified to a reading course for less than 4 students enrolled.

References


Richard A. Johnson (Author), Dean W. Wichern


Method of Assessment
Homework (20% by each of four instructors) and in-class presentation (20%)

2 Session Information

1-2 (Sep. 10, 17). Multivariate Analysis (I)
- Descriptive Analyses of Multivariate Data
- Multivariate Normal Distribution and Its Inferences
- Analysis of Repeated Measures and Longitudinal Data

3-4 (Sep. 24 and Oct. 1). Examples of Novel Analytic Approaches
- Quantile regression
- Instrumental Variables Approach
5-6 (Oct. 8 and 15). Multivariate Analysis (II)

- Discriminant analysis
- Principal components analysis
- Factor analysis

7-8 (Oct. 22, 29). Applied Regression Analysis Techniques

- This module is designed to provide students with an applied understanding of multivariable regression models most often encountered by epidemiologists and biostatisticians. Attention will be limited to linear regression and logistic regression. Concepts addressed include:
  - Objectives of regression analysis
  - Model assumptions
  - Confounding and interaction
  - Creation of exposure and outcome representations
  - Accounting for sampling methods
  - Sensitivity analysis
  - Interpretation and reporting

9-11 (Nov. 5, 12, 19). Survival Analysis

- Survival function (curve) and hazard function
- Estimation and comparison of survival functions
- Parametric survival models
- Cox Proportional Hazards (Regression) Models
- Competing risks

12 (Nov. 26). Student Presentation of Special Topics in Biostatistics

Sample topics in previous years:
- Polytomous (or Polychotomous) logistic regression
- Ordinal outcome data (ordinal regression)
- Bootstrap
- Ridge regression
- Generalized linear mixed model (GLMM)
- Reliability — Kappa statistic and intraclass correlation
- Decision analysis
- Regression tree and recursive partitioning
- ROC curves
- Small area analysis
- Spatial statistics
- Meta analysis