BIOS 6212: Survival Analysis

Spring 2016

Credit Hours: 3
Day/Time: Mondays & Wednesdays/9:00-10:20 AM
Location: Room 309

INFORMATION ON COURSE INSTRUCTOR
Course Director: Lee McDaniel Ph.D., Assistant Professor
Biostatistics Program
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COURSE DESCRIPTION

This course provides students with statistical methodology for the analysis of time-to-event data and trains students in the appropriate analysis of survival data, by both parametric and nonparametric methods. Emphasis will be placed on methods and models most useful in clinical research with attention to proper interpretation of statistical packages output. This course is intended for biostatistics majors nearing the end of the master's level coursework.

Students will learn (1) methodology for survival data, (2) use of software to carry-out its statistical analysis, and (3) enhance their ability to communicate results from such analyses. Students are expected to gain real-life experience in data analysis of time-to-event data and to be effective contributors to health sciences research.

The course will be conducted majorly by instructor lectures. Beyond class participation, homework assignments, and exams, students will carry-out data analysis for a dataset, write-up a report of these results, and present the results to an audience.

Pre-requisites: BIOS 6102: Biostatistical Methods II or BIOS 6202: Applied Linear Models.

COURSE OBJECTIVES

Students successfully completing this course will be able to:

- Identify the need for specific methods when having time-to-event data, the types of censoring occurring, and the importance of assessing exposure times
- Obtain estimates of survival functions, carry out comparisons of survival functions, and present results
- Derive and interpret life tables
- Obtain, analyze and present results of regression analyses with the primary purpose of identifying risk or prognostic factors related to survival and the evaluation of treatments in clinical trials by means of Cox's regression methods and maximum likelihood techniques.
- Estimate sample sizes for certain procedures
- Obtain, analyze and present results of Cox regression applied to variants of cohort studies

SCHOOL OF PUBLIC HEALTH COMPETENCIES COVERED

MPH PROGRAMS COMPETENCIES

- Apply exploratory data analysis and descriptive statistics to summarize public health data.
- Apply common statistical methods for estimation and inference appropriately according to underlying assumptions and study design principles

MPH BIOSTATISTICS PROGRAM COMPETENCIES

- Explain the role that probability and statistical distributions play in inferential statistics and decision-making.
- Advise researchers and public health professionals on translating research questions into testable hypotheses to advance public health.
- Prepare appropriate analytic approaches for public health research questions, use corresponding statistics method to test the null hypotheses, and draw conclusions based on the testing results.
- Selectively apply hypothesis tests for comparing treatment strategies and exposure groups appropriate to the type of response measurement (e.g., binary, ordinal, continuous).
- Perform power analysis and sample size calculations to aid in the planning of public health studies.
- Communicate to colleagues and clients the assumptions, limitations, and (dis)advantages of commonly used statistical methods and describe preferred methodological alternatives when assumptions are not met.
- Use computer software for acquisition, management and analysis of data and presentation of results.
- Create and present oral and written reports of the methods, results and interpretations of statistical analyses to both statisticians and non-statisticians.

Ph.D. BIOSTATISTICS PROGRAM COMPETENCIES

- Apply and extend as needed current statistical methods to address current and emerging issues in medicine and public health.
- Identify situations requiring an innovative statistical approach and develop the necessary statistical methods to solve problems of biological, biomedical, or public health importance.
- Determine appropriate study designs to evaluate interventions and risk factors.
- Integrate the latest advances in statistical methods and theory into research and practice.
- Construct complex power analysis and estimates of sample size for the planning of clinical and research studies.
- Communicate to clients and colleagues the assumptions, limitations, and (dis)advantages of commonly used statistical methods, and describe preferred methodological alternatives when assumptions are not met.
- Design and develop databases to facilitate statistical analysis
- Formulate written statistical analysis plans for clinical trials and research studies that accurately address the study hypotheses and design.
- Present oral and written reports of methods, results and interpretations of the statistical analyses to both statisticians and non-statisticians.

EVALUATION AND GRADING PROCEDURES

Grading of this course will be based on the following aspects:

1) In-class mid-term exams, 20%. There will be 1 mid-term in-class.
2) Homework, 30%. Homework assignments will account for 30% of the final grade. Students in the Ph.D. Biostatistics program will get to solve extra exercises.
3) Participation in class, 20%. Students' participation in class accounts 20% of the final grade.
4) Project write-up and presentation, 30% (Final Exam). A project write-up and its presentation to the class will account for 30% of the final grade. The project consists of a dataset to be analyzed and a report of the analyses/results to be prepared and presented in-class.

Grade based on your combined score will be assigned as follows:

A=90-100%
B=80-89%
C=75-79%
D=70-74%
F=Below 70%.

POLICIES AND EXPECTATIONS

A. Attendance is mandatory and no delayed submission of assignments will be accepted, except under extraordinary circumstances.
B. Personal wireless devices are to be turned off at entering classroom. Noncompliance will result in being asked to leave the classroom.
C. Discussion among students about homework and project is encouraged; however, submitted work must be each student write-up.
D. Student participation is expected to be active; students' biostatistical training is assumed to be at a fairly advanced stage and an increased ability through this course to deal with data analysis is to be demonstrated.
E. Regarding the project. The write-up is expected of a quality such that a researcher reading the report of data analyses would be able to produce a draft of a paper for journal submission.
F. Any information regarding grades will be given in person only, with previous appointment.

Students are expected to acquaint themselves with school-wide policies and procedures found in the *LSUSPH Student Handbook*:
Grade Appeal
Student Misconduct
Disabilities

A student who qualifies for special academic accommodations under the Americans with Disabilities Act must notify the course director so that appropriate arrangements may be made. The student must complete the Notification of Disability form and email it to the course director within one week of the course start date.

READINGS

TITLE: **Survival Analysis, Techniques for Censored and Truncated Data**
by John P. Klein and Melvin L. Moeschberger
ISBN: 978-0387-95399-1
Publisher: Springer-Verlag
Publish Date: 2003 (2nd Ed)
List Price: USD 126.50
http://www.springerlink.com/content/978-0v-387-95399-1/contents/

TITLE: Applied Survival Analysis: Regression Modeling of Time to Event Data
by David W. Hosmer, Stanley Lemeshow, & Susanne May
ISBN: 978-0471-75499-2
Publisher: Wiley
Publish Date: 2008-02 (2nd Ed)
List Price: USD 123.00
http://www.addall.com/New/submitNew.cgi?query=978-0471754992&type=ISBN

TITLE: How to Report Statistics in Medicine: Annotated Guidelines for Authors, Editors, and Reviewers
by Thomas A Lang, Michelle Secic
ISBN: 978-193051369-3
Publisher: American College of Physicians
Publish Date: 2006 (2nd Ed)
List Price: USD 64.95
http://www.amazon.com/How-Report-Statistics-Medicine-Guidelines/dp/1930513690

AVAILABLE SUPPORT SERVICES

Website for Hosmer-Lemeshow-May book:
ftp://ftp.wiley.com/public/sci_tech_med/survival/

Course Description – Tentative Schedule of Topics

Consider the following schedule a **very** rough guide; times indicated will vary.

Lecture	**Topics**
1/13	Introduction to Survival Data (Ch. 1)
1/18	Survival functions, hazard functions (2.1-2.3)
1/20	Cumulative hazards, mean residual life, restricted mean life (2.4)
1/25	Parametric models (2.5-2.6)
1/27	Parametric models, likelihoods (2.5-2.6)
2/1	Censoring and truncation (3.1-3.5)
2/3	Censoring and truncation (3.1-3.5)
2/3	Estimation of survival functions (4.1-4.2)
2/8	Off for Lundi Gras
2/10	Estimation of hazard, cumulative hazard, and confidence bands for survival functions (4.3)
2/15	Hypothesis testing
2/17	Hypothesis testing
2/22	Hypothesis testing
2/24	**Exam 1**
2/29	Hazard Regression models (8.1)
3/2	The partial likelihood (8.3-8.4)
3/7	Fitting the model
3/9	Interpretation of the results
3/14	Estimation of the survival function (8.8)
3/16	Putting covariates in the model (8.2, 8.6)
3/21	Model selection (8.7)
3/23	Residuals (11.1-11.3, 11.5)
3/28	Checking the model (11.4, 11.6)
3/30	Stratified proportional hazards models (9.1)
4/4	Time-varying covariates (9.2)

4/6	Additive hazards models – Lin and Ying (10.3)
4/11	Additive hazards models – Aalen (10.2)
4/13	Checking the additive hazards assumption
4/18	Competing risks (2.7)
4/20	Frailty models
4/25	Recurrent events
4/27	Sample size and power
5/2	**Presentations**
5/4	**Presentations**
5/9	**Presentations**