

STA 6177 / PHC 6937: Applied Survival Analysis
UF College of Public Health and Health Professions
Fall, 2016

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When: Tuesday 7th and 8th periods (1:55 – 3:50 pm) in Rolfs 205
Thursday 7th period (1:55 – 2:45 pm) in Pugh 120
Office hours by appointment

Objectives:

Survival analysis is about the analysis of time-to-event data. It is one of the most widely applied branches of statistics. In public health and medicine, it is the theoretical foundation for the design and analysis of cohort and case-control studies. The goal of this course is to help you understand the fundamental concepts of survival analysis and their applications in epidemiology. Basic concepts from probability and calculus will be reviewed as needed.

Calendar:

- Aug. 23 Probability, random variables, distributions, and expectation & variance
- 30 Estimation of probabilities: Prevalence and incidence, LLN and CLT, calculus, and the delta method
- Sept. 6 Fundamental concepts of survival analysis: Censoring, survival and hazard functions, failure-time distributions, and maximum likelihood estimation
- 13 Empirical CDF and the Kaplan-Meier and Nelson-Aalen estimators
- 20 Cohort studies, measures of association, and accelerated failure time models
- 27 **Exam 1**
- Oct. 4 Log-rank test
- 11 Semiparametric relative-risk regression: the Cox model
- 18 Cox model: baseline hazard estimation and correction for ties
- 25 Building and interpreting regression models
- Nov. 1 Residuals and goodness-of-fit for regression models
- 8 **Exam 2**
- 15 Confounding and stratification: Mantel-Haenszel and the stratified log-rank test
- 22 Stratified Cox models, case-control studies, and conditional logistic regression
- 29 Cox model extensions: Competing risks, recurrent events, and time-dependent covariates
- Dec. 6 Additional topics and review; final exam distributed
- 13 **Final exam due**

Class format and website:

Tuesday will be two hours of lecture divided into four segments. Each segment will be approximately 20 minutes with 5 minutes for questions. There will be a fifteen-minute break between periods. You are encouraged to bring a hard copy of the lecture notes to class, and laptops are allowed.

Thursday will be a problem-solving session where we work on the problem sets. This will be crucial for reviewing concepts, learning to apply them, and preparing for the exams. Laptops are allowed.

Class website:

There will be a class website on Canvas. You will need to sign in with your Gatorlink ID and password. Lecture notes, announcements, and other files will be posted here. Technical issues can be resolved at the UF Helpdesk (<http://helpdesk.ufl.edu>) or E-learning Support (<https://lss.at.ufl.edu/help.shtml>)

Problem sets:

Problem sets will be given each week unless there is an exam. You are encouraged to work together, but you should write up your own results. They will not be graded, but they will be important for learning the material and preparing for the exams.

Exams:

There will be two midterm exams and one final exam. The midterm exams will be in class with open notes. Calculators are allowed, but laptops and cell phones are not. The final exam will be a take-home exam. The exams will use problems adapted from the problem sets.

Readings:

There is no required textbook for the course. The primary readings will be lecture notes.

Good textbooks for epidemiology are *Epidemiology: An Introduction* by Kenneth J. Rothman (Oxford University Press, 2012) and *Statistical Models in Epidemiology* by David Clayton and Michael Hills (Oxford University Press, 1993). Good basic textbooks on survival analysis are: *Applied Survival Analysis, 2nd edition* by David W. Hosmer, Stanley Lemeshow, and Susanne May (Wiley-Interscience, 2008) or *Survival Analysis Using SAS: A Practical Guide, 2nd edition* by Paul D. Allison (SAS Press, 2012). More advanced textbooks that cover the class material are: *The Statistical Analysis of Failure Time Data (2nd Edition)* by John D. Kalbfleisch and Ross L. Prentice (Wiley Series in Probability and Statistics, 2002), *Survival and Event History Analysis: A Process Point of View* by Odd Aalen, Ørnulf Borgan, and Håkon Gjessing (Springer-Verlag, 2008), and *Modeling Survival Data: Extending the Cox Model* by Terry M. Therneau and Patricia M. Grambsch (Springer-Verlag, 2000).

Software:

All statistical computing in the class will be done in R (<https://cran.r-project.org/>). An introduction to R is available online (<https://cran.r-project.org/doc/manuals/R-intro.pdf>). Many of the functions we use will be in the `survival` package (<https://cran.r-project.org/web/packages/survival/survival.pdf>). From within R, this can be installed using the command: `install.packages("survival")`.

Grading:

- 15% Class participation
- 25% Exam 1 (in class September 27)
- 25% Exam 2 (in class November 8)
- 35% Final Exam (due December 13)

Class attendance:

Requirements for class attendance, make-up exams, and other work in this course are consistent with University of Florida policies at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Accommodations:

Students with disabilities requesting accommodations should first register with the Disability Resources Center (352-392-8565; www.dso.ufl.edu/drc/). Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Please register as early as possible in the semester.

Online feedback:

Students are expected to provide feedback on the quality of instruction in this course by completing the online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

University of Florida Honor Code

UF students are bound by the Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.” On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code specifies a number of behaviours that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to the appropriate personnel. The full student conduct and honor code is at <https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>.

U Matter, We Care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to many other helping resources including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.