COURSE OBJECTIVES
Event history analysis is a special class of statistical techniques devoted to the analysis of duration, survival or time-to-event data. Wherever it is of interest to describe social processes, event history techniques are finding their application, whether in the study of divorce, fertility behavior, job stability, unemployment duration, poverty traps, law adoption or even government failure. Given its practical importance and appeal, the course provides an introduction to event history analysis with social science data. We are going to discuss non-parametric methods for exploratory and descriptive analyses, the Cox regression model, parametric regression models as well as event history regression analysis in discrete time. For each method, the course covers essentials of model formulation, data organization, estimation techniques, model specification, interpretation, hypothesis testing and model diagnostics. Among the more advanced topics, we will treat issues like time-dependent covariates and time-dependent effects, unobserved heterogeneity, competing risk models, models for interdependent processes and treatment of left-truncated cases. Coverage of specific advanced topics will respond to student projects and interest.

Throughout the class, I will emphasize the practical application of event history methods with real-world social science data, drawing on examples from demographic, sociological, economic and political science research. For our own statistical work, I will rely on the STATA package which offers excellent facilities for event history analysis. If you already work on a project using event history data, you will be able to use your data in this class.

COURSE PREREQUISITES
I presume a solid statistical background, notably solid working knowledge of multiple (OLS) regression and, ideally, the logit (logistic regression) model as acquired in Sociology 362 or similar courses. Also, you should be comfortable with the use of one of the major statistical software packages, preferably STATA versions 8 and up. You will be able to replicate most of what this course covers in alternative packages like SPSS, SAS, S-Plus/R, AML, TDA, LIMDEP, GAUSS or SYSTAT, though I might be able to provide less than helpful assistance in these cases, depending on the specific package.
COURSE REQUIREMENTS AND GRADING
Successful completion of the course requires you to attend course sessions and work through the materials before and/or after sessions. In addition, you will have to respond to small weekly problem sets, hand in 4 graded assignments during the course and submit a term paper by exam week. The weekly problem sets will not be graded, but will consist of small questions and/or exercises that invite you to reflect on the material covered in the week’s session. The graded assignments will require you to conduct your own small-scale data analysis with publicly available data from the Wisconsin Longitudinal Survey, including data preparation, description of data, estimation of parameters and interpretation of results. There will be 3 such assignments, each following one of the course lab sessions. In addition, a fourth assignment (due by December 8th) will require you to comment on the utility and specific methodology of event history modeling in published research on a specific topic of social science interest (if you are writing a term paper for this class, this essay can be on the same topic, i.e. the assignment essay may be a draft version of the literature/methodology review section(s) of your eventual term paper).

The term paper has to be an empirical research paper that applies event history techniques to a social science issue (broadly defined). The choice of substantive topic is yours. The term paper should be equivalent in style to a journal article, i.e. it should raise a problem, discuss earlier research and results, formulate precise hypotheses to be tested, describe the data and operationalization of concepts and, naturally, present estimates of appropriate statistical models as well as their substantive interpretation. A topic proposal for the paper should be submitted by the end of October. The completed paper should be submitted by exam week but no later than by the end of day, Wednesday, December 22\textsuperscript{nd}. Please submit an electronic copy of the term paper to either the Learn@UW dropbox or mgangl@ssc.wisc.edu directly (pdf, rtf or Word formats acceptable).

Assignments will contribute 25 percent to the final grade and the paper 75 percent. For assignments and the term paper I expect you to do original and individual work. Of course, mutual discussion and consultation among course members is strongly encouraged. However, plagiarism will lead to course failure.

READING LIST
There are many excellent textbooks on event history analysis available. For the course, I am mostly drawing on the following list of books and I strongly suggest that you work through the relevant chapters in at least one of them (the detailed reading list below offers additional readings on specific, typically more advanced topics). In addition, I also list a couple of shorter overview articles that may help you to orient yourself at any point in the seminar.

Textbooks (* indicate especially recommended ones available at University Bookstore)


**Interpretation of hazard rate models**


**Textbooks / reference manuals for use with STATA**

*Blossfeld, Hans-Peter, Katrin Golsch and Götz Rohwer (2006). *Event History Analysis with Stata*. College Station, TX: Stata Press. (BGR)


**Overview papers**


Advanced statistical/mathematical treatments (optional reading)


As far as possible, all course readings from the core (starred) textbooks will be put on electronic reserve through the course website on Learn@UW.

COURSE MATERIALS
This course is accompanied by a course web site on the Learn@UW platform at

https://learnuw.wisc.edu/

That website is intended as a major resource to the course and provides you with copies of all course materials – lecture notes, assignments, datasets and STATA programs. Also, you will be able to submit assignments and your term paper via the dropbox on our Learn@UW website. In addition, we also have the classlist

soc952-2-f10@lists.wisc.edu

for e-mail communication among class.
Course Schedule

Introduction
09/08 Introduction and course organization
09/15 Basic concepts of event history modeling:
observation plans, data structure, mathematical fundamentals

Nonparametric (descriptive) methods
09/22 Life table estimation 1: the actuarial method
09/29 Life table estimation 2: Kaplan-Meier estimator
10/06 Lab session 1: Data management and descriptive analyses (I)
10/13 --- ATTENTION: WILL BE RESCHEDULED ---
Lab session 2: Data management and descriptive analyses (II)

Regression models
10/20 Discrete-time event history modeling 1: basics
10/27 Discrete-time event history modeling 2:
Time-dependent effects and time-dependent covariates
11/03 Lab session 3: Regression modeling – discrete-time methods

PAPER PROPOSALS DUE
11/10 Cox regression 1: basics and interpretation
11/17 Cox regression 2: model diagnostics and extensions
11/24 Parametric regression models
12/01 Lab session 4: Regression modeling – Cox regression and parametric methods

METHODOLOGICAL ESSAY DUE

Advanced topics (TENTATIVE)
12/08 Multiple destination states (competing risks models)
12/15 Unobserved heterogeneity
Course evaluation and final discussion

EXAM WEEK
12/22 TERM PAPER DUE
## Course Reading

### Introduction

**09/08** Introduction and course organization
- What is event history analysis?

**09/15** Basic concepts of event history modeling:
  observation plans, data structure, mathematical fundamentals
  - Markov processes:
    - states, transitions, events and waiting times
  - survival functions and the hazard rate
  - data collection through cross-sectional vs. longitudinal designs
  - censoring and truncation

SW chapter 9; HL chapter 1; BR/BGH chapters 1+2; KM chapters 1-3; AL84 chapter 1; AL95 chapters 1+2; YA chapter 1
Background reading on Markov processes: Howard 1971, chapters 1-2

### Nonparametric (descriptive) methods

**09/22** Life table estimation 1: the actuarial method
  - discrete-time data
  - mathematics of the life table
  - actuarial (life table) estimator of survival and hazard functions
  - statistical inference

SW chapter 10; BR/BGH chapter 3.1; KM chapter 4; AL95: 41-50

**09/29** Life table estimation 2: Kaplan-Meier estimator
  - continuous-time data
  - Kaplan-Meier and Nelson-Aalen estimators of survival and hazard functions
  - statistical inference
  - comparisons of survival and hazard functions across groups

SW chapter 13; HL chapter 2; BR/BGH chapter 3.2+3.3; KM chapters 6+7; AL95 chapter 4

**10/06** Lab session 1: Data management and descriptive analyses (I)
CGGM chapter 5-8; BGH chapter 3
StataSurv: stset, stdes, stsum, sts list/graph/test

**10/13** Lab session 2: Data management and descriptive analyses (II)
CGGM chapter 5-8; BGH chapter 3
StataSurv: stset, stdes, stsum, sts list/graph/test
Regression models

10/20  Discrete-time event history modeling 1: basics
- episode splitting
- logit, probit and complementary log-log models
- the logit model in event history analysis: estimation, hypothesis testing, presentation and interpretation of results
- modeling duration dependence in the hazard rate
SW chapter 11; AL84 chapter 2; AL95 chapter 7; YA chapter 3
for background reading on categorical data analysis, esp. on the logit model:

10/27  Discrete-time event history modeling 2:
Time-dependent effects and time-dependent covariates
- time-dependent covariates
- time-varying effects
- causality and temporal order
- residuals and model diagnostics
SW chapter 12; YA chapter 4; BR/BGH chapter 6 (ignore the fact that chapter presumes knowledge of exponential models)

11/03  Lab session 3: Regression modeling – discrete-time methods
AL95 chapter 7
StataRef: logit, probit, cloglog

11/10  Cox regression 1: basics and interpretation
- model assumptions:
  proportional hazards and arbitrary duration dependence in baseline hazard
- partial likelihood (PL) estimation
- hypothesis testing
- presentation and interpretation of results
SW chapter 14; HL chapters 3+4; BR/BGH chapter 9; AL84 chapter 4; AL95 chapter 5 (pp. 111-137); KM chapter 8; YA chapter 5
11/17  Cox regression 2: model diagnostics and extensions
  • residuals and model diagnostics
  • time-dependent covariates
  • time-varying effects
  • stratified models

SW chapter 15.1-15.4; HL chapters 6+7; BR/BGH chapter 9; AL95 chapter 5 (pp. 139-end); KM chapter 9; YA chapter 6

11/24  Parametric regression models
  • Exponential and piecewise-exponential models:
    model formulation, estimation, presentation and interpretation of results
  • Alternative proportional hazards models:
    Weibull and Gompertz distributions
  • Non-proportional hazards models (accelerated failure time models):
    Log-normal, log-logistic and generalized Gamma models
  • Model diagnostics and statistical inference

BR/BGH chapters 4-8; HL chapter 8.2-8.5; AL84 chapter 3; AL95 chapter 4; KM chapters 11-13

12/01  Lab session 4: Regression modeling – Cox regression and parametric methods

CGGM chapters 9-11, 12-14; BGH chapters 4-9
StataSurv: stcox, streg, stcurve

Advanced topics (TENTATIVE)

12/08  Multiple destination states (competing risks models)
  • mathematical background
  • model identification
  • estimation and interpretation of results:
    competing risks models in discrete and continuous time

SW chapter 15.5; BR/BGH chapter 4.2; AL95 chapter 6
Unobserved heterogeneity
- definition and implications
- model identification
- parametric versus non-parametric approaches
- repeated events or clustered (multilevel) data

HL chapter 9.3; BR/BGH chapter 10; AL95 chapter 8 (pp. 233-246)


Social Science Applications of Event History Methods

(selected topics only, choose one of the topics/reading lists for your methodological essay if you do not want to do that essay for a subject of your own choice or if there is too little published research on the topic of your term paper)

Poverty


Divorce


**Job mobility**


**Fertility**


