JPSM/MPSM 895.002/BIOSTAT 855: Regression Models in Complex Sample Design Settings

Meeting Time and Place

Tu 3-5:30 Location ISR 368
Office Hours: By appointment

Course Summary

This course examines a range of statistical regression analysis techniques for modeling survey data, and presents methods to compensate for design features for complex sample survey data. Course topics include likelihood estimation and testing; application of likelihood methods to linear and generalized linear models, including logistic, probit, generalized (multinomial) logit, Poisson, and negative binomial models; time-to-event (survival analysis) models; regression models for longitudinal data; and propensity score and Bayesian regression modeling. In general the course will proceed by considering the particular regression model in the simple random sample setting, and then considering the effect of accounting for the complex sample survey design (stratification, clustering, and weighting) on the inference. Issues such as model misspecification and ignorable vs. non-ignorable sampling in the context of regression modeling will be addressed. In general a design-based approach will be considered, although the application of fully Bayesian regression models in the complex sample design setting will be considered at the end of the course.

Prerequisites

Biostatistics/Survey Methodology 617 and Biostatistics 650/651, or Biostatistics/Survey Methodology 617 and Survey Methodology 685/686, or instructor permission.

Texts

Required: A*nalysis of Health Survey Data,* Korn and Graubard
Recommended: *Model-Assisted Survey Sampling,* Sarndal, Swenson, and Wretman.
Analysis of Survey Data, Chambers and Skinner, Eds.
Background: *Survival Analysis:Techniques for Censored and Truncated Data,* Klein and Moeschberger
An Introduction to Generalized Linear Models, 2nd Edition, Dobson
Generalized, Linear, and Mixed Models McCulloch and Searle
Journal article handouts

Grades

Homework (~weekly until midterm):	$33^{1/3}$%
Midterm (take-home):	$33^{1/3}$%
Final Project:	$33^{1/3}$%

Instructor

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Schedule

The following are the expected dates of lecture topics and exams, as well as the location from which the instructor will be lecturing:

Date	*Location*	*Topic and Reading Assignment*
Sep 6	***Ann Arbor***	Course Introduction. Review of single and multi-stage sample designs.
13	***College Park***	Inference for complex sample designs: construction of sampling weight and variance estimation of descriptive statistics via linearization methods.
20	***Ann Arbor***	Variance estimation of descriptive statistics via replication methods; estimating degrees of freedom, domain estimation.
27	***Ann Arbor***	Likelihood inference; review of linear models
Oct 4.	***Ann Arbor***	Review of generalized linear models.
11	***College Park***	Linear/generalized linear models in complex sample designs: targets of inference (design- vs. model-based). Point estimation for GLM in complex sample designs.
18	***Ann Arbor***	**No Class – Semester Break**
25	***Ann Arbor***	Variance estimation for linear/generalized linear models in complex sample designs. Model fit and model checking for linear/generalized linear models in complex sample designs; model misspecification in the population inference setting.
Nov. 1	***Ann Arbor***	Review of time-to-event (survival) models
8	***Ann Arbor***	Variance estimation, model fit, and model checking in survival models in complex sample designs.
15	***College Park***	Review of hierarchical linear/generalized linear regression models.
22	***Ann Arbor***	Variance estimation, model fit, and model checking in hierarchical linear/generalized linear regression models in complex sample designs.

29	***Ann Arbor***	Bayesian modeling with complex sample designs.
Dec 6	***Ann Arbor***	Non-parametric regression in complex sample designs.
13	***College Park***	Presentation of final projects