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“Special Section for Health Sciences Students”

Instructor: Darby Thompson

Lab Instructor: [Robin Insley](#)

Prerequisite:

Completion of STAT 201 or 203.

Textbook:

Principles of Biostatistics, 2nd Edition, Pagano M, Gauvreau K.. Pacific Grove, CA: Duxbury, 2000.

Course Description:

Intermediate statistical techniques for the health sciences. Review of introductory concepts in statistics and probability including hypothesis testing, estimation and confidence intervals for means and proportions. Contingency tables and the analysis of multiple 2x2 tables. Correlation and regression. Multiple regression and model selection. Logistic regression and odds ratios. Basic concepts in survival analysis.

Outline:

This course provides an opportunity for the further development of analytic skills acquired in basic courses in statistics and the health sciences. It concentrates on the relatively few techniques that are currently most used in health research, but it also seeks to provide a conceptual basis for understanding other techniques as well. An attempt is made to focus on unifying principles and widely applicable methods as opposed to presenting an array of unrelated ad hoc methods. The material is presented descriptively, from the point of view of understanding and practical use.

The emphasis of the course is on analysis (rather than design) of primarily observational studies where there is one outcome variable of primary interest and where the data are made up of multiple independent observations. Important areas not covered are: classical multivariate analysis (e.g., factor analysis, discriminant analysis, etc.), longitudinal data analysis, time series, random effects models, and experimental design considerations (e.g., Latin squares, etc.).

Objectives:

By the end of the course the participant should:

1. understand the concept of a statistical model and how such models correspond to specific hypotheses or questions,
2. be able to interpret the results of an analysis in relation to the original questions or hypotheses that motivated the analysis,
3. be familiar with data analysis methods commonly used in health sciences and understand the basic limitations of competing methods,
4. understand and be able to critique the analysis methods described in published health research papers,
5. be able to communicate effectively with statistical consultants.

Topics:

The scheduling of the following topics is approximate:

1. Review of introductory statistics: Hypothesis testing, estimation and confidence intervals for means and proportions.
2. Review of basic concepts of probability with applications including diagnostic testing, sensitivity and specificity, the relative risk and the odds ratio.
3. Contingency Tables: The Chi-square test, $r \times c$ tables, multiple 2×2 tables, Simpson's paradox, Mantel-Haenszel method.
4. Correlation and simple linear regression: Regression concepts, estimation and testing for regression coefficients, evaluation of the model.
5. Multiple linear regression: Inference for regression coefficients, confounding and interaction, indicator variables, model selection, prediction, model assumptions and checking.
6. Logistic regression: Odds ratios, inference for regression coefficients, model assumptions and checking, case-control studies.
7. Time permitting: Survival analysis including life tables, censoring, Kaplan-Meier method, log-rank test.

Grading Scheme:

Grading is subject to change

Assignments – 25%

Quizzes – 25%

Final Exam – 50%

Examinations:

There will be in-class quizzes and final which are closed book examinations. Exam questions will be of a general nature and emphasize the interpretation of analysis results rather than complex formula calculations. The students will not be required to memorize formulas and may bring a two-sided formula sheet into the exams.

Assignments:

In completing assignments, consultation with other students regarding computer programming methods and difficulties is allowed and encouraged. You should, however, come to your own conclusions, and be prepared to defend them. Methods used should be described and shown, and brief computer output should be included with the answer. Familiarity with computers in general, and the JMP statistical package in particular, will be assumed. Students should have familiarity with JMP software from STAT 201/203.

Students should be aware that they have certain rights to confidentiality concerning the return of course papers and the posting of marks. Please pay careful attention to the options discussed in class at the beginning of the semester. Students are reminded that Academic Honesty is a cornerstone of the acquisition of knowledge. Scholarly integrity is required of all members of the University. Please consult the General Guidelines of the calendar for more details.