

**Advanced Quantitative Methods for Health Care Professionals
PUBH 742 – Spring 2017**

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Class Notes: Copies of the class lecture slides are posted on Sakai under “Course Documents” and “PUBH 742 Lectures”; you may want to print them off to bring to class. You will get the most out of the lectures if you read the notes before class – the pace of the class is fast. It’s difficult to know exactly how much material will be covered in each class. The assigned pages for each lecture are usually correct, but sometimes we will cover more or less material than indicated.

There are lecture notes from PUBH 741 that it will help you to review. These will be listed in the syllabus and are available on Sakai in “Course Documents” in a folder called “PUBH 741 Lectures”.

Several articles are posted on Sakai. Many of these are suggested readings, but enhance topics in the lectures and/or make good references.

Suggested Texts: (not necessary for class, but you may want to have as references)

Hosmer DW and Lemeshow S, *Applied Logistic Regression*, 3rd Edition, 2013

Kleinbaum DG and Klein M, *Logistic Regression*, 3rd Edition, 2010

Class Location: 132 MacNider (**Note:** 322 MacNider on 2/10)

Class Schedule:

Thursday	11:50–1:45
Friday	10:10–12:05

Course Work:

Problem Sets – Assignments 1-5 to be completed and a hardcopy turned in at the end of each problem set session. It’s okay to help each other out, particularly if you are stuck on a concept or a Stata command, but you will learn best if you do as much of the work on your own as possible. Final write-ups should be done independently. There will be no final exam.

Problem Set Sessions: These sessions will be used to discuss answers to problem sets, as well as any other questions. There is 1 problem set on exploratory data analysis, 3 on logistic regression, and 1 on survival analysis.

Additional Links (Stata Resources, lectures, etc.):

www.stata.com (main website for Stata)

www.ats.ucla.edu/stat/stata/ (UCLA site with helpful Stata information and tutorials)

http://www.cpc.unc.edu/research/tools/data_analysis/statatutorial/index.html (Carolina Pop. Ctr.)

www.pitt.edu/~super1 (Supercourse lecture repository; WHO Collaborating Center, Pittsburgh)

Syllabus – 2017

Part 1: Sampling and Sample Size [Note: Part 1 will be covered starting on 04/13]

Part 2: Exploratory Data Analysis

Thurs 1/12

PUBH 742 Course Overview

Review of PUBH 741 exam – Bring a copy of your final exam and the example solutions to class (the example solutions are posted on Sakai for PUBH 742 under “Course documents”)

Exploratory Class 1

Topics: Continuous variables (univariable)

Lecture notes: pp. 2.1.1–2.1.17 [slides: Part 2\Explore1]

Fri 1/13 – Exploratory Class 2

Topics: Continuous variables (bivariable); Categorical variables (univariable, bivariable)

Lecture notes:

PUBH 741 Review: Categorizing continuous X variables [“PUBH741-Part5.pdf”; pp. 5.13–5.50];
Transforming X variables [“PUBH741-Part5.pdf”; pp. 5.63–5.98]

PUBH 742 notes: pp. 2.1.18–2.1.68 [slides: Part 2\Explore1]

Thurs 1/19 – Exploratory Class 3

Topics: Influential data points; Collinearity; Missing data; Confounding

Lecture notes: pp. 2.2.1–2.2.2.37; 2.3.1–2.3.4 [slides: Part 2\Explore2, Explore3]

(Note: **Skip** slides 2.2.38–2.2.56)

Fri 1/20 – Exploratory Class 4

Topics: Confounding (cont.); Interaction; Exploratory data analysis summary

Lecture notes: pp. 2.3.5–2.3.52 [slides: Part 2\Explore3]

Thurs 1/26 – Problem set #1 on Exploratory Data Analysis [Exploratory Classes 1 – 4]

[Note: Also, **Linear Regression Review** lecture on this day – see below]

Part 3: Logistic Regression

Thurs 1/26 – Linear Regression Review

Topics: Review of multiple linear regression

Lecture notes: pp. 3.1.1–3.1.33 [slides: Part 3\Linear1]

Note: Read over slides before class – not time to cover all of them

Fri 1/27 – Logistic Class 1

Topics: Overview of logistic regression: model, Odds ratios, Confidence intervals

Lecture notes: pp. 3.2.1–3.2.32 [slides: Part 3\Log2]

Part 3: Logistic Regression (cont.)**Thurs 2/2 – Logistic Class 2**

Topics: Odds ratios and confidence intervals with interaction; Coding the exposure
Lecture notes: pp. 3.2.33–3.2.61 [slides: Part 3\Log2]

Fri 2/3– Logistic Class 3

Topics: Coding exposure variable (cont.); Maximum likelihood estimation; Likelihood ratio tests;
Modeling strategies
Lecture notes: pp. 3.2.62–3.2.87; 3.3.1–3.3.23 [slides: Part 3\Log2, Log3]

Thurs 2/9 – Logistic Class 4

Topics: Examples – traditional Epidemiologic model; Modeling categorical variables with more than two categories (intro)
Lecture notes: pp. 3.3.24–3.3.75 [slides: Part 3\Log3]
Article: Sun G, Shook TL, Kay GL. Inappropriate use of bivariable analysis to screen risk factors for use in multivariable analysis. *J of Clin Epidemiol*, 1996; 49(8):907-916

Fri 2/10 – Logistic Class 5 (**Note**: Class meets in 322 MacNider)

Topics: Modeling categorical variables with more than 2 categories (cont.); Ordinal and nominal outcomes (more than 2 categories)
Lecture notes: pp. 3.3.76–3.3.114 [slides: Part 3\Log3]

Thurs 2/16 – Problem set #2 on Logistic Regression [Logistic Classes 1 – 4]**Fri 2/17 – Logistic Class 6**

Topics: Calculating risk ratios from binomial regression models; Intro to longitudinal models [GEE]
Lecture notes:
PUBH 741 Review: Cluster sampling pp. 5.3–5.10 [slides: "PUBH741-Part5.pdf"]
PUBH 742 notes: pp. 3.4.1–3.4.49 [slides: Part 3\Log4]
Article: Zou G. A modified Poisson regression approach to prospective studies with binary data. *AJE* 2004; 159(7):702-6.
Mercier RJ, Garrett J, Thorp J, Siega-Riz AM. Pregnancy intention and postpartum depression: secondary data analysis from a prospective cohort. *BJOG* 2013;120:1116–1122.

Thurs 2/23 – Logistic Class 7

Topics: Continuation of longitudinal models [GEE]
Lecture notes: pp. 3.4.50–3.4.86 [slides: Part 3\Log4]

Fri 2/24– Problem set #3 on Logistic Regression [Logistic Classes 5 & 6]

Article: Schulman KA, Berlin JA, Harless W, et.al. The effect of race and sex on physicians' recommendations for cardiac catheterization. *NEJM* 1999; 340(8):618-26

Part 3: Logistic Regression (cont.)**Thurs 3/2 – Predictive Class 1**

Topics: Predicted risk; Strategy: variable selection, descriptive statistics, specifying starting model, variable reduction, quantifying predictive ability, validation

Lecture notes: pp. 3.5.1–3.5.36 [slides: Part 3\Predict5]

Article: Concato J, Feinstein AR, Holford TR. The risk of determining risk and multivariable models. *Ann Intern Med* 1993; 118:201-210

Sun G, Shook TL, Kay GL. Inappropriate use of bivariable analysis to screen risk factors for use in multivariable analysis. *J of Clin Epidemiol*, 1996;49(8):907-916

Fri 3/3 – Predictive Class 2

Topics: Example study; Quantifying predictive ability

Lecture notes: pp. 3.5.37–3.5.83 [slides: Part 3\Predict5]

Article: Wasson JH, Sox HC, Neff RK, Goldman L. Clinical prediction rules. *N Engl J Med* 1985; 313:793-799.

Pryor DB, Harrell FE, Lee KY, Califf RM, Rosati RA. Estimating the likelihood of significant coronary artery disease. *Amer J Med* 1983; 75:771-9

Thurs 3/9 – Predictive Class 3

Topics: Comparing ROC curves; Reliability; Model validation

Lecture notes: pp. 3.5.84–3.5.118 [slides: Part 3\Predict5]

Fri 3/10 – Predictive Class 4

Topics: Validation (cont.); Strategy for a predictive linear regression model

Lecture notes: pp. 3.5.119–3.5.156 [slides: Part 3\Predict5]

Article: Carson SS, Garrett J, Hanson LC, et.al. A prognostic model for one-year mortality in patients requiring prolonged mechanical ventilation. *Crit Care Med*, 2008;36(7):2061-9.

Thurs 3/16 – Spring Break**Fri 3/17 – Spring Break****Thurs 3/23 – Problem set #4 on Predictive Models [Predictive Classes 1 – 4; Carson article]****Part 4: Survival Analysis** (Note: pages covered approximate for Part 4)**Fri 3/24 – Survival Class 1**

Topics: Review of survival analysis

Lecture notes: pp. 4.1.1–4.1.52 [slides: Part 4\Surv1]

Articles: Tibshirani R. A plain man's guide to the proportional hazards model. *Clinical and Investigative Medicine* 1982;5(1):63-8.

Thurs 3/30 – Survival Class 2

Topics: Cox proportional hazards model; Proportional hazards (PH) assumption

Lecture notes: pp. 4.2.1–4.2.59 [slides: Part 4\Surv2]

Part 4: Survival Analysis (cont.)**Fri 3/31 – Survival Class 3**

Topics: PH assumption (cont.); Modeling strategy; Exploratory data analysis; Example (one exposure)
Lecture notes: pp. 4.2.60–4.2.75, 4.3.1–4.3.45 [slides: Part 4\Surv2 & Surv3]

Thurs 4/6 – Survival Class 4

Topics: Example (predictive model); Time dependent covariates; Repeated events
Lecture notes: pp. 4.3.46–4.3.60; pp. 4.4.1–4.4.30 [slides: Part 4\Surv3 & Surv4]

Fri 4/7 – Survival Class 5

Topics: Competing risks
Lecture notes: pp. 4.4.31–4.4.72 [slides: Part 4\Survival]
Article: Gourlay ML, Fine JP, Preisser JS, May RC, Li C, Lui L, Ransohoff DF, Cauley JA, Ensrud KE.
Bone-Density Testing Interval and Transition to Osteoporosis in Older Women. NEJM
2012;366(3):225-233.

Thurs 4/13 – Problem set #5 on Survival Analysis [Survival classes 1 – 4]

[**Note:** Also, first sampling lecture on this day – see below]

Part 1: Sampling and Sample Size**Thurs 4/13 – Sampling Class 1**

Topics: Sample selection; Sample size background
Lecture notes: pp. 1.1.1–1.1.36 [slides: Part 1\Sample1]

Fri 4/14 – Holiday (no class)**Thurs 4/20 – Sampling Class 2**

Topics: Calculations (2-sample t-test, paired t-test, two proportions, risk ratio, odds ratio, ANOVA)
Lecture notes: pp. 1.2.1 – 1.2.52 [slides: Part 1\Sample2]

Fri 4/21 – Sampling Class 3

Topics: Calculations (cluster design, equivalency trials, non-inferiority trials)
Lecture notes: pp. 1.2.53–1.2.101 [slides: Part 1\Sample2]

Thurs 4/27 – Sampling Class 4 [Note: Last day of PUBH 742]

Topics: Correcting for survey design (sample weights, etc.)
Lecture notes:
PUBH 741 Review: Cluster sampling pp. 5.3–5.10 [slides: “PUBH741-Part5.pdf”]
PUBH 742 notes: pp. 1.3.1–1.3.37 [slides: Part 1\Sample3]

Fri 4/28– Extra class [make-up]