DEPARTMENT: Environmental Health
COURSE NUMBER: EH 593R      SECTION NUMBER: 000      SEMESTER: Spring 2015
CREDIT HOURS: 1
COURSE TITLE: Data Analysis in Environmental Health

INSTRUCTOR NAME Owen Devine

INSTRUCTOR CONTACT INFORMATION
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OFFICE HOURS: By appointment

BRIEF COURSE DESCRIPTION
This course provides a general review of analytic methods commonly used in the analysis of environmental health data with a specific emphasis of areas that will likely be useful to students in the analysis of their thesis or capstone research data. The course consists of lectures and interactive discussions focused on general topics in epidemiologic analyses but will also address specific analytic complexities often encountered in the analysis of environmental health-related data. Additional topics may be discussed based on the particular interests and research activities of the students. Pre-requisite: Students must bring thesis or capstone related data to the class.

LIST SCHOOL LEVEL, DEPARTMENT, AND/ OR PROGRAM COMPETENCIES

MSPH in Environmental Health and Epidemiology:
- Develop an epidemiologic study to address an environmental health question
- Conduct basic epidemiologic analysis of environmental health data
- Interpret results of epidemiologic studies of an environmental health question

MPH in Environmental Health and MPH in Global Environmental Health
- Apply the principles of epidemiology to assess health effects of environmental exposures
LIST LEARNING OBJECTIVES ASSOCIATED WITH THE COMPETENCIES

The objectives of this course focus on providing students with a review of analytic methods that will be useful in the assessment of data related to both their thesis research and in the general analysis of environmental health data. Course lectures and discussions will cover basic definitions, assumptions and analytic approaches, but students will learn primarily through the application of the techniques in their own research areas. The class is highly interactive and students will be encouraged to discuss their particular research activities and analytic questions. Topics to be covered include:

- Sampling error and its impact on statistical inference
- Study design and sample size estimation
- Data collection methods
- Developing and testing statistical hypotheses
- Basic data summarization measures for discrete and continuous outcome data
- Linear regression and generalized linear modeling techniques
- Analytic approaches for missing and missmeasured data
- Computational issues
- Interpretation and summarization of the analytic results

EVALUATION

Evaluation will be based on a combination of class participation, including raising analytic topics of interest, discussing methodologies to accomplish those analyses and identification and application of methods appropriate to the student’s particular research interests, and a presentation of the student’s thesis- or capstone-focused research that illustrates these competencies. This course has a satisfactory/unsatisfactory grading basis.

Class Participation: 50%
Class Presentation: 50%
Data Analysis in Environmental Health

Weekly Course Outline¹ – Readings from scientific literature will be assigned as appropriate

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1.</td>
<td>Sampling error as the basis for statistical analysis, estimating population parameters based on random samples, inference on population parameters, introduction to hypothesis testing.</td>
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<tr>
<td>2.</td>
<td>Developing hypotheses and conducting inference using observed information, p_values and confidence intervals, correct interpretation of sampling-based hypothesis testing</td>
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<td>3.</td>
<td>Study designs for epidemiologic analyses, impact of study design on analysis and interpretation of results, sample size estimation and power. Crude analysis of dichotomous outcomes, probability-based estimates, risk ratios, odds ratios, tests for association, assessment of dichotomous outcomes with multiple levels of exposure</td>
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<tr>
<td>4.</td>
<td>Linear regression, least squares estimation, maximum likelihood estimation, inference on model parameters, multiple linear regressions</td>
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<tr>
<td>5.</td>
<td>Overview of generalized linear regression, logistic and Poisson regression, maximum likelihood in generalized linear models, inference for model parameters, overview of survival analysis</td>
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<tr>
<td>6.</td>
<td>Overview of analysis of survey data, analysis of data from simple random surveys, extension to complex survey designs. Issues in the analysis of environmental health-related epidemiologic data: repeated measurements and other forms of non-independent data, missing data, uncertainty in exposure measurements, non-random sampling.</td>
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<tr>
<td>7.</td>
<td>Student presentations on their selected research topics</td>
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<tr>
<td>8.</td>
<td>Student presentations on their selected research topics</td>
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¹ These are suggested topics. The order and specific issues covered may be altered to better fit the research interest of class participants