

OEH:6460 Quantitative Exposure Assessment

Fall 20xx

Tuesdays and Thursdays 8-9:15 AM

CPHB C301

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Description

Students will understand the fundamental concepts and methods to design occupational and environmental exposure assessment studies, analyze exposure data, interpret the results of data analyses, and link exposure data to health outcome data. Students will develop skills to identify and use appropriate analytic methods and to interpret data relevant to the field of occupational and environmental health. The course addresses the principles of quality control of exposure data collection, exposure assessment, and interpretation of data to determine occupational and environmental disease risks and to guide intervention efforts. The course also covers study planning, survey techniques, risk assessment, and real time sensor data processing.

Upon successful completion of this course, the student will be able to:

1. Evaluate the quality of OEH data
2. Select analytical methods to test a hypothesis using OEH data
3. Compute the exceedance fraction to estimate how much of the underlying population can be expected to exceed some value (aka, exposure or regulatory limit)
4. Identify optimized models to determine the appropriateness of combining data across groups given between- and within-variance in the data
5. Apply tools to identify significant covariates to estimate OEH exposures/concentrations
6. Use appropriate analytic methods to interpret data relevant to the field of occupational and environmental health.

Goals

Students will understand fundamental concepts and methods to summarize exposure data, evaluate their distributions, and interpret the results in order to make decisions on the results. At this time, classroom examples will focus primarily on *occupational exposure data sets* and will expand to include environmental data, as relevant to the students enrolled.

Requirements

1. Classes will consist of *pre-recorded lectures* to be viewed weekly *before meetings* to discuss live on Thursdays. Each week, you will be instructed on new analytical techniques via pre-recorded lessons and then given data to use to apply that technique for in class discussions in live sessions on Thursdays. *Students will be responsible for preparing for each class by completing the reading assignments and completing any assigned analyses.* Students will be responsible for attending class and participating in class discussions.

2. Materials, including data sets and spread sheets, will be posted on ICON. Contact hours in class will devote time to performing and interpreting analyses, which *requires students to prepare personal computers prior to class meetings.* Specific notes on computer setup will be provided on ICON. Students will **present analyses weekly, as detailed in ICON**, and interpret data analyses from literature in class. These activities account for 15% of the grade.

3. **Exams (take home)** – Two take home exams are scheduled. For those taking the 1-credit version of the course, you will complete Module 1 lessons and complete the first exam. For those taking the class for three credits, there will be two exams (Module 1 and Module 2). Both exams are practical, intended to have students apply analyses discussed in class to data set(s) to demonstrate a basic understanding of concepts in the class. There is no exam to cover items in Module 3, but these techniques could be incorporated into projects (see item 4).

4. **Project** – For those in the 3-credit class, students will complete a semester-long **project** which requires students *to find and analyze* a set of exposure/concentration data. Each student **must apply at least three techniques from the class** and submit a report (in the style of a manuscript) to describe and interpret an analysis of this data set. With approval from your research advisor, you may use data from your current research projects. Alternatively, we have identified OEH faculty who have data sets appropriate for the completion of this project. See the “recommended timeline” posted on ICON for managing your workload to successfully complete this project. Throughout the semester, students will provide progress updates (in class) for their project, with a final summary presentation at the end of the semester.

Required readings/websites:

Additional articles will be posted on ICON for reading on specific topics throughout the semester to assist with understanding of the course materials. Students are expected to read and be ready to discuss these articles in classes.

Grades

Grades will be determined as follows:

For 1-credit course: **25 pt total** accumulation

- **ONE** take home examinations (application of methods and interpretations covered in class)—20 points
- **Topic quizzes – 3 pt** Low-risk quizzes have been developed for topics throughout the semester. They assess basic knowledge from the asynchronous lectures (and associated

lecture notes). Five quizzes for Module 1 contribute 3 points overall (0.6 pt each); these must be completed before Exam 1.

- **In-class** participation, including contributions to hands-on data analysis/interpretation of case studies – 2 pt for weekly contributions. (0.5 pt/week, up to 2 pt total; hence, not every week is required).

For 3-credit course: **100 pt total** accumulation

- **TWO** take home examinations (application of methods and interpretations covered in class)—20 pt each (total 40)
- **One** final manuscript/report for data assessment project --40
- **In-class** participation, including project updates (see schedule) and contributions to hands-on data analysis/interpretation of case studies – 15 (10 pt for weekly contributions; 5 pt for presentation of final report). Note that we meet over 15 weeks, so points will only be given for weekly participation when contributions are made; every week is not needed to achieve full 10 pt.
- **Topic quizzes** Low-risk quizzes have been developed for topics throughout the semester. They assess basic knowledge from the asynchronous lectures (and associated lecture notes). Each quiz is scored to 0.6 pts; you will need to complete 9 of them to accumulate your 5 pt score for quizzes. - 5 pt total. (Note: I will multiply the sum of the best 9 quizzes by (5/5.5) for the final weighted 5 pt total)

Standard letter grades will be assigned, using:

A = 90 -100%, B=80-89%, C=70-79%, D=60-69%, F=<60%

Access to Instructor(s)

The course information has been assembled to provide details to students *asynchronously*; thus, we will not meet live twice per week, but once per week. Check the syllabus schedule. Clearly, students do not need to meet on Tuesdays at 8 am, but this time is available for office hours after you have completed asynchronous materials. Office hours will be live (S333 for Anthony) or via Zoom (link below). The instructor will be logged in to Zoom at 8 am. If no student arrives to a Zoom office hour after 15 minutes of its start, the instructor will end the session *unless a student has made a specific request to meet later in the office hour period (before 9:15 am)*. Contact the instructor if additional office hours are needed outside of these class times.

Zoom links for office hours are:

TBD: Check ICON if we need to go use Zoom

Competencies for OEH:6460

Items 1-5 are intermediate steps developed throughout the semester used to build to the overall course competency, #6 below, which maps to the key competency that this course **provides for the OEH PhD**.

Successful completion of Quantitative Exposure Assessment is accomplished when students can:	Mapped to Assessment Tools:
1. Evaluate the quality of OEH data	Exam 1; Project: Criteria B
2. Select analytical methods to test a hypothesis using OEH data	Take home exams 1, 2 and Project
3. Compute the exceedence fraction to estimate how much of the underlying population can be expected to exceed some value (aka, exposure or regulatory limit)	Take home exams 1, 2
4. Identify optimized models to determine the appropriateness of combining data across groups, given between and within variance (e.g., -2 res log likelihood)	Take home exam 2
5. Apply tools to identify significant covariates to estimate OEH exposures/concentrations	Take home exam 2
6. Use appropriate analytic methods to interpret data relevant to the field of occupational and environmental health.	Project – See grading rubric for assessment of each of the following: data quality (B), appropriateness of method given hypothesis (C), generate descriptive data (D), present findings using two additional techniques (E, F), discuss relevance and strength (G).

HOUSEKEEPING

Administrative Home

This course is given by the College of Public Health. This means that class policies on matters such as requirements, grading, and sanctions for academic dishonesty are governed by the College of Public Health. Students wishing to add or drop this course after the official deadline must receive the approval of the Associate Dean for Academic Affairs in the College of Public health. Details of the University policy of cross enrollments may be found at [Cross-Enrollment Policy](#).

Electronic Communication

University policy specifies that students are responsible for all official correspondences sent to their standard University of Iowa e-mail address (@uiowa.edu). Students should check this account frequently.

Sharing of Class Recordings

Sessions in this course will be pre-recorded, recorded or live-streamed. Such recordings/streaming will *only* be available to students registered for this class. These recordings are the intellectual property of the faculty and they may not be shared or reproduced without the explicit, written consent of the faculty member. Further, students may not share these sessions with those not in the class, or upload them to any other online environment. Doing so would be a breach of the Code of Student Conduct, and, in some cases, a violation of the Federal Education Rights and Privacy Act (FERPA).

ACADEMIC MISCONDUCT

Plagiarism and any other activities when students present work that is not their own are academic fraud. Academic fraud is a serious matter and is reported to the departmental DEO and to the Associate Dean for Education and Student Affairs. Instructors and DEOs decide on appropriate consequences at the departmental level while the Associate Dean enforces additional consequences at the collegiate level. **It is the student's responsibility to seek clarification of any situation in which he/she is uncertain whether plagiarism is/has been involved. Students who are uncertain about what constitutes plagiarism should consult with the course instructor.** Students are expected to abide by the University of Iowa Code of Student Life, which clearly defines academic misconduct (1.1a). Academic misconduct is defined by the University of Iowa in its Code of Student Conduct here: [Policies & Regulations Affecting Students](#)

Academic Misconduct includes but is not limited to the following:

- presentation of ideas of others without credit to the source;
- use of direct quotations without quotation marks and without credit to the source;
- paraphrasing without credit to the source;
- participation in a group project which presents plagiarized materials;
- failure to provide adequate citation for material obtained through electronic research;
- downloading and submitting work from electronic databases without citation;
- submitting material created/written by someone else as one's own, including purchased term/research papers;
- copying from someone else's exam, homework, or laboratory work
- allowing someone to copy or submit one's work as his/her own;
- accepting credit for a group project without doing one's share;
- submitting the same paper in more than one course without the knowledge and approval of the instructors involved;
- using notes or other materials during a test or exam without authorization;
- not following the guidelines specified by the instructor for a "take-home" test or exam.

Academic misconduct undermines the efforts and achievements of other students, erodes the trust and credibility that society places in educational institutions, and can have long-lasting consequences for the individuals involved. Incidents of academic misconduct will be investigated and reported in a manner that ensures due process and fairness. If a report of academic misconduct is founded, then sanctions (penalties) may be applied at the course level

(e.g., grade reduction) and the department/program level (e.g., required enrollment in an academic integrity seminar, dismissal from the program, etc.). Reports of academic misconduct are tracked across programs and colleges.

For undergraduate students, more information about the College of Public Health's policies on academic misconduct for undergraduates can be found here - <https://www.public-health.uiowa.edu/student-handbook-undergraduate>.

For graduate students, more information about your department's policies on academic misconduct can be found in your graduate student handbook - <https://www.public-health.uiowa.edu/student-handbooks/> - and in the Graduate College Manual - <https://grad.uiowa.edu/academics/manual/academic-program/section-iv-academic-standing-probation-and-dismissal>.

Artificial Intelligence

It is out there, we know it. Your exams and projects will require you to interpret cases and apply knowledge learned. At this time, AI often gives information irrelevant to the question at hand and puts you in peril of not getting points defined in the rubric. It is also not a succinct tool to communicate answers to complex problems, and AI often generates false information and presents sources that do not exist. Your job this semester will be to find information and build *your* toolbox of skills to identify and prevent injuries, and while AI can give you a start, it really is not going to help you answer specific questions posed by assignments. If you do use AI in *any* of your assignments, even just to begin to formulate your answer, you must attribute it as a source (see <https://dal.ca.libguides.com/CitationStyleGuide/citing-ai>) and include the question you posed to the AI system used. Regardless of your use of AI, as always, it is your responsibility to have coherent and succinct answers/discussions to answer the question posed by the assignment.

Classroom Behavior:

General: The ability to learn is lessened when students engage in inappropriate classroom behavior, distracting others; such behaviors are a violation of the [University Policies](#) (See Code of Student Life, E.5-E.6). Students are expected to comply with University policies regarding appropriate classroom behavior as outlined in the [Code of Student Life](#). While students have the right to express themselves and participate freely in class, it is expected that students will behave with the same level of courtesy and respect in the virtual class setting (whether asynchronous or synchronous) as they would in an in-person classroom. Failure to follow behavior expectations as outlined in the [Code of Student Life](#) may be addressed by the instructor and may also result in discipline under the [Code of Student Life](#) policies governing E.5 Disruptive Behavior or E.6 Failure to Comply with University Directive.

Cell Phones & Pagers: Set cell phones and pagers to silent prior to entering class. Do not speak on the phone in class. If online, mute your microphone/stop your camera if you must take a call or talk to someone during class.

Concerns about Faculty Actions

Students who have a concern about a faculty action should first address the issue with the instructor, then the course supervisor (if there is one), and then the departmental DEO or the Undergraduate Program Director, as appropriate. Students may also contact the Associate Dean for Academic Affairs in the College of Public Health.

Another resource for students is the Office of the University Ombudsperson. If a complaint cannot be resolved at the departmental and/or collegiate level, students may file a formal complaint utilizing the procedure specified in the Operations Manual (II-29.7)

<https://opsmanual.uiowa.edu/community-policies/hearing-regulations-alleged-violations-regents-rules/initial-steps>.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit [Hawk Alert](#).

UNIVERSITY COURSE POLICIES AND RESOURCES FOR STUDENTS

At the University of Iowa, we strive for a classroom or laboratory climate that encourages learning while also protecting the freedoms and rights of our students and faculty. Please review the following course policies, expectations, and resources at

<https://provost.uiowa.edu/student-course-policies>. Visit the Dean of Students website for additional [student policies and procedures](#).

- Absences for Military Service Obligations
- Absences for Religious Holy Days
- Absences from Class
- Accommodations for Students with Disabilities
- Basic Needs and Support for Students
- Classroom Expectations
- Free Speech and Expression
- Mental Health
- Non-Discrimination Statement
- Sexual Harassment/Sexual Misconduct and Supportive Measures
- Sharing of Class Recording (if applicable)

Syllabus – Quantitative Exposure Assessment - Fall 2023
Course Schedule

Date	Module / Topic	Live/Not	Quiz Available?
8/22 T	Tuesday - Introduction <i>Live</i> syllabus and ICON review; project discussion; setup for semester	LIVE	-
	MODULE 1: Descriptive Statistics and Data Distributions		
8/24 Th	1b: Intro and General Concepts – Recorded discussions of a. Outline exposure/risk paradigm b. Impact of exposure assessment goal on strategy c. Review of key exposure assessment terminology	No	Q1-1
8/29 T	Complete these <i>Asynchronously</i> 2A Descriptive Stats 2B Distributions 2C Transformations 2D Normality Tests 2E Individual Decisions	No	Q1-2i
8/31 Th	<i>Live</i> : Show 02A data file; 02C Excel table (2A-2C) Discuss Individual Decisions (2E)	LIVE	-
9/5 T	Complete: 2F Aggregated Data Decisions 2G SAS coding	No	Q1-2ii
9/7 Th	<i>Live</i> : 2E Individual Decisions (table) 2F: Results of N=10, N=20/OEL 100/50 analyses 2G SAS Access/coding questions (for 3-credit students)	Live	-
9/12 T	Complete: 3: Censored Data 4: Hypothesis	No	Q1-3&4
9/14 Th	<i>Live</i> : Present sensitivity of SOLVER analysis to LOD/2 use (Censored Data 2) Discuss your data set (for project) and possible hypotheses (4)	Live	-
9/19 T	Complete: 5: Data Quality	-	Q1-5
9/21 Th	<i>Live</i> : Present data quality assessment (5) and prep for Module 1 exam	Live	-
	EXAM 1: Take Home – Available Sept 23 (Sat), due to ICON 8 AM Sept 29 (Fri)		
	MODULE 2: Testing Your Data		
9/28 T	1: Intro to SEGs (asynchronous)	No	Q2-1
10/3 T	Models 1&2: 2A: Overview 2B: One-way ANOVA 2C: One-way Random Effects 2D: SEG Decisions (programming Exceedance, overexposure, fold)	No	Q2-2

Date	Module / Topic, continued	Live/Not	Quiz Available?
10/5 Th	Live: Meet to walkthrough COPE data set analysis (2D) and Rapp 1999 basic exceedance (2D)	Live	-
10/10 T	Model 3: Random Effects with Nested Groups 3A: Setup 3B: Example illustration		Q2-3
10/12 Th	Live: Report Rapp 1999: analyze as ONE single group (Model 1); run Model 3: Can you combine? Determinates	Live	-
10/17 T	Model 4: Determinates		Q2-4
10/19 T	Live: Results of Rapp 1999 modeling for determinates (appropriate model 3 version + all, backward elimination → simplified)	Live	-
10/24 T	Section 5: Light Wrap up Module 1&2		Q2-5
10/26 Th	LIVE: Case Study: Nested Design (Fethke)	Live	Q2-6
10/31 T	Live: Prep for Exam 2 (Module 2 Part 6 Review)	Live	
	EXAM 2: Take Home – Available 11/3, due to ICON 11/8 (Tue) at 8 am		
	Module 3 Topics: Final selection based on class projects		
11/7 T	Monte Carlo: RECORDED a. How to address uncertainty in exposure estimates b. Overview of Monte Carlo process c. Application of Monte Carlo to concentration estimates (well-mixed room) d. Documenting assumptions and limitations	No	Q3-A
11/9 Th	Live: Monte Carlo Setup and Demo We will review data results from simple case (individual: How many N to get stable answer) then agree and set up sheet for ADRI (make decisions before we meet live)	Live	-
11/14 T	Topic 2...e.g., Direct-reading monitor data processing (NF)		-
11/16 Th	Topic 2... e.g., Direct-reading monitor case study (NF)		-
11/21 T 11/23 Th	Thanksgiving Recess!! No classes at UI Nov. 20-24		
11/28 T	Live: Project guidance/consulting	Student Driven	No
11/30 Th	Live: Project guidance/consulting		
12/5 T	Student Presentations	Student presentations	No
12/7 Th	Student Presentations		
	<i>Exam week is Dec 11-15: We have no final in this class</i>		
	Note that Module 3 Topics may change based on class projects		
	TURN IN final project manuscript and appendices with supporting data: by 5 PM Dec 12		

