

SPPH 567: Quantitative Methods for the Assessment & Analysis of Exposure Data (Winter 2023/2024)

In-Class Sessions: Fridays from 09:00-11:00 in **SPPH 143** most weeks

In-Class Assessment: Fridays from 11:00-11:30 in **SPPH 143** most weeks

Asynchronous Materials: Posted every weekend

Instructor: Sarah Henderson
Email: Use Canvas mail (sarah.henderson@bccdc.ca only if Canvas unavailable)
Phone: 604-910-9144 (for emergencies only)
Office hours: Fridays 11:30-14:30 (in-person at SPPH)
By appointment with 48-hour lead time

Teaching assistant: Katherine White
Email: Use Canvas mail (k.white@alumni.ubc.ca only if Canvas unavailable)
Office hours: Tuesdays 13:00-14:00 (in-person at SPPH or online)

Overview:

The work of occupational and environmental hygiene professionals requires quantitative competency for collecting useful samples, analyzing data, interpreting the results, and understanding the limitations. This course is designed to give you hands-on experience with these principles so that you feel confident collecting and working with data in the field.

Learning Objectives:

The main goals of this course are for you to learn:

- How to select and conduct analyses of occupational or environmental exposure data
- How to use statistical software and learn new techniques so that you feel comfortable working with the software on your own
- How to design appropriate measurement strategies for various purposes, including monitoring for compliance, epidemiology, and determinants of exposure

The course will use real exposure data sets and challenge you to think for yourself about how to design and conduct both sampling campaigns and analyses of the resulting data. Other objectives for this course are to teach you how to effectively give and receive critical appraisal of your work as you develop your tasks, and to develop your ability to work in teams.

Software:

For this course we will be using R and RStudio. Installation is free and will be covered in the first week of class. You can choose to use other statistical software such as SAS or STATA if you prefer, but the instructor and TA will not be available for technical support. You cannot choose to use spreadsheet software such as Microsoft Excel.

Course Assessment:

This course will be graded out of 100 marks.

There is one task due in every week of the course (13 total). Nine of these tasks will be completed in class on Friday mornings, and four will be completed online. In class tasks will be closed book. **There will be no make-up task available if you are unable to attend in person.** The following materials will be allowed:

- Pen or pencil
- Paper (provided by the instructor)
- Scientific calculator (not mobile phone)

Each task will receive a score from 0 to 3, based on the assessments below. If a task has multiple questions, each question will be scored from 0 to 3, and the average across all questions will be taken for the task. No part scores will be given on individual questions.

- 0 = inadequate and/or completely incorrect
- 1 = adequate and/or somewhat correct
- 2 = competent and/or mostly correct
- 3 = excellent and/or perfectly correct

All tasks will be based on the video lectures and reading materials from the previous week. If you do not review these materials carefully, you cannot expect to do well on the tasks. Some questions will require simple calculations, but most will require critical thinking about the course material and its application.

At the end of the course, **your top nine scores will be used to calculate your final grade.** The overall score will be tied to a normal distribution (i.e., bell curve), such that a score of 2.0 will correspond to a median mark of 82% (i.e., the middle of the A- range). An overall score of 3.0 will correspond to a maximum mark of 100% (i.e., the top of the A+ range), and an overall score of 1.0 will correspond to a minimum mark of 64% (i.e., the bottom of the C+ range).

Course Interaction:

The entire online portion of the course will be available through Canvas. You can choose to use other tools outside of Canvas for interacting with your peers, but they will not be required. Any online office hours or synchronous online sessions (if needed) will be held in Zoom, which can be accessed through Canvas. All asynchronous content videos will be hosted on Vimeo. The Vimeo link for each video will be embedded in Canvas for easy viewing in full screen mode.

Academic Integrity:

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work.

Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious

consequences may apply if the matter is referred to the President’s Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences. A more detailed description of academic integrity, including the University’s policies and procedures, may be found in the Academic Calendar.

Use of Generative Artificial Intelligence (AI):

Students are encouraged to use tools such as Chat GPT if they find them beneficial in their study processes. However, students should understand that such tools often [hallucinate](#), especially when synthesizing scientific evidence. While the technology will improve over time, it cannot yet replace specialized training in occupational and environmental health, or other fields. Indeed, you may be asked to critique information or summaries produced by Chat GPT as part of your assessment in this course.

Course Schedule:

An overview of the course schedule is provided in the table below.

	Week	In class session?	Type of assessment task
1	Jan 6 – Jan 12	No – Cascadia	Online
2	Jan 13 – Jan 19	Yes	In class
3	Jan 20 – Jan 26	Yes	In class
4	Jan 27 – Feb 2	Yes	In class
5	Feb 3 – Feb 9	Yes	In class
6	Feb 10 – Feb 16	No – instructor unavailable	Online
Reading Break			
7	Feb 24 – Mar 1	Yes	In class
8	Mar 2 – Mar 8	Yes	In class
9	Mar 9 – Mar 15	Yes	In class
10	Mar 16 – Mar 22	Yes	In class
11	Mar 23 – Mar 29	No – Easter Friday	Online
12	Mar 30 – Apr 5	Yes	In class
13	Apr 6 – Apr 12	No – instructor unavailable	Online

A detailed schedule of the course as planned is laid out below for each week of the 13 weeks. Adaptations may be necessary as we progress through the course.

Week 1: Jan 6 –Jan 12	
Weekend	<ul style="list-style-type: none"> - Data for first half of course posted - Data dictionary posted - R Tutorial 1 posted - Task #1 (online) posted: Video introduction
Monday	- Official start of term
Tuesday	- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none"> - No in class session due to the Cascadia conference - Task #1 due by midnight

Week 2: Jan 13 – Jan 19

Weekend	<ul style="list-style-type: none">- Video lecture #1: variable types- Video lecture #2: frequency distributions- Video lecture #3: normal distribution- Video lecture #4: lognormal distribution- Video lecture #5: limits of detection- Readings- R Tutorial 2 posted- Scores for task #1 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #2 (in-class): distributions and limits of detection- Sarah office hours 11:30-14:30

Week 3: Jan 20 – Jan 26

Weekend	<ul style="list-style-type: none">- Video lecture #1: statistical tests and p-values- Video lecture #2: dichotomous vs. continuous associations- Video lecture #3: simple linear regression with untransformed values- Video lecture #4: simple linear regression with log-transformed values- Readings- R Tutorial 3 posted- First set of practice R questions posted- Scores for task #2 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #3 (in-class): statistical tests and simple regression- Sarah office hours 11:30-14:30

Week 4: Jan 27 – Feb 2

Weekend	<ul style="list-style-type: none">- Video lecture #1: review of key concepts- Video lecture #2: ANOVA- Video lecture #3: simple linear regression with categorical variables- Readings R- Tutorial 4 posted- Second set of practice R questions posted- Scores for task #3 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:30-11:00 (note time change)- Task #4 (in-class): ANOVA and simple regression- Sarah office hours 11:30-14:30

Week 5: Feb 3 – Feb 9

Weekend	<ul style="list-style-type: none">- Video lecture #1: continuous vs. continuous variables- Video lecture #2: simple linear regression with continuous variables- Video lecture #3: multiple linear regression- Readings- Third set of practice R problems posted- Scores for task #4 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #5 (in-class): variable types and regression- Sarah office hours 11:30-14:30

Week 6: Feb 10 – Feb 16

Weekend	<ul style="list-style-type: none">- Video lecture #1: collinearity- Video lecture #2: confounding- Video lecture #3: interaction- Video lecture #4: variable selection- Video lecture #5: prediction- Readings- Scores for task #5 posted- Task #6 (online) posted: Video explaining a statistical concept
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- No in class session- Katherine available at UBC during class hours (09:00-12:00)- Task #6 due by midnight

Reading Break: Feb 17 – Feb 23

Week 7: Feb 24 – Mar 1

Weekend	<ul style="list-style-type: none">- Video lecture #1: walking through the data analysis process- Video lecture #2: introduction to logistic regression- Readings- Fourth set of practice R problems posted- Scores for task #6 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #7 (in-class): Building a multiple linear regression- Sarah office hours 11:30-14:30

Week 8: Mar 2 – Mar 8

Weekend	<ul style="list-style-type: none">- Video lecture #1: introduction to toxicokinetics- Reading: Rappaport paper on smoothing at the receptor- Scores for task #7 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #8 (in-class): Rappaport paper- Sarah office hours 11:30-14:30

Week 9: Mar 9 – Mar 15

Weekend	<ul style="list-style-type: none">- Video lecture #1: introduction to sampling strategy- Video lecture #2: statistical elements of sampling- Readings- Scores for task #8 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #9 (in-class): Sample strategy- Sarah office hours 11:30-14:30

Week 10: Mar 16 – Mar 22

Weekend	<ul style="list-style-type: none">- Video lecture #1: sampling for compliance- Video lecture #2: ascertainment of compliance- Readings: Kromhout papers on similarly exposed groups (SEGs)- Scores for task #9 posted
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #10 (in-class): Sampling for compliance- Sarah office hours 11:30-14:30

Week 11: Mar 23 – Mar 29

Weekend	<ul style="list-style-type: none">- Video lecture #1: sampling for compliance- Video lecture #2: ascertainment of compliance- Readings: Kromhout papers on similarly exposed groups (SEGs)- Scores for task #10 posted- Task #11 (online) posted: Video on similarly exposed groups
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- No in class session due to Easter Friday- Task #11 (online) due by midnight

Week 12: Mar 30 – Apr 5

Weekend	<ul style="list-style-type: none">- Video lecture #1: sampling for epidemiology and job exposure matrices- Video lecture #2: introduction to PIMEX methods- Reading: Kromhout paper on SEGs in epidemiology- Scores for task #11 posted: Overall sampling strategy
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- In-class session 09:00-11:00- Task #12 (in-class)- Sarah office hours 11:30-14:30

Week 13: Apr 6 – Apr 12

Weekend	<ul style="list-style-type: none">- Scores for task #12 posted- Task #13 (online) posted: Personal reflection
Tuesday	<ul style="list-style-type: none">- Katherine office hour 13:00-14:00
Friday	<ul style="list-style-type: none">- No in class session- Task #13 (online) due by midnight