In-person classes take place on UBC Point Grey Campus, which is located on the traditional territory of the Musqueam people.

COURSE INFORMATION

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<th>Course Title</th>
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<td>Causal Inference in Public Health Sciences</td>
<td>SPPH 681A</td>
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TIME AND PLACE

1. Term 1, Weekly 3-hour class on Mondays, 2 to 5 pm, Room SPPH102
2. Term 1, Weekly 1-hour tutorial on Thursdays, 9 to 10 am, Room SPPH102

PREREQUISITES

This 600-level course builds on the knowledge and skills acquired in SPPH500, SPPH503, and SPPH548. Working knowledge of statistical software is recommended.

INSTRUCTORS

Prof. Boris Sobolev, office hours: Wednesdays, 9 to 11am, Room 705 at VGH Research Pavilion, or by appointment boris.sobolev@ubc.ca

COURSE DESCRIPTION

Causal inference from observational data is common in health research. The goal of this 3-credit course is to develop knowledge and skills in causal inference. The course offers in-depth coverage of methods of causal analysis developed over the past three decades. We will explore probabilistic causality, causal diagrams, counterfactuals, mediation analysis, and evaluating treatment effects.

COURSE STRUCTURE

The course combines lectures, discussions, and tutorials with in-class and homework assignments based on provided materials. We will use the "flipped classroom" approach. Students are expected to be prepared for each class by reviewing pre-recorded videos, readings, and other materials at home. Class time will involve revisiting topics, group discussions, collaborative work, and evaluation. You will receive a road map for each class in advance. It will detail the learning objectives and provide links to materials to review.

SCHEDULE OF TOPIC

This course consists of 12 modules. For each module, I provide readings, videos and tutorials that complement each other. The readings introduce topics, the videos discuss key ideas, and the tutorials help you apply them in practice. The tutorials will use your knowledge of R from previous courses. Additional tutorials will teach creating and analyzing causal diagrams. Please consult the tentative weekly schedule for details.
RATIONALE FOR TAKING THIS COURSE

This course will be useful for those who analyze data from patient registries, routine medical records, hospital discharges, or research cohorts. After taking it, you will be able to create causal diagrams for your thesis projects, refine your research questions, find variables to adjust, detail your analysis plan, and attempt to estimate causal effects using data from your projects. Whether studying epidemiology, public health, occupational health, or environmental health, you will benefit from the lectures, videos, tutorials, and readings in 681A! We will start by outlining the framework for causal reasoning. You will get a full exposition of causal reasoning. Then you will learn about the conditions for classifying associations as causal. The course will then invite you to master causal reasoning by practical application to real data.

LEARNING OUTCOMES

On completion of the course, students will be able to

1. explain the framework of causal inference;
2. develop directed acyclic graphs and identify a minimal sufficient adjustment set;
3. estimate total, direct and indirect treatment effects from observational data; and
4. express causal queries through counterfactuals quantities.

ASSESSMENT OF LEARNING

Evaluation will be conducted using a combination of marks for 12 in-class assessments (maximum 24% of the total mark), six homework assignments (36%), and final homework assignment (40%).

In-class assignments

Each class involves assessment of the learning progress in class. The assessment tools will include a combination of multiple-choice tests and short writing exercises covering the content from lectures, in-class discussions and required readings. The assessments provide an opportunity for students to evaluate their own progress through the course and help strengthen their understanding of core concepts and methods. Each test is worth 2 points (maximum 24 points for 12 tests).

Homework assignments

Bi-weekly homework assignments will involve various aspects of data analysis and preparing short reports. The quality of each report will be judged by clarity of presentation, suitability of methods, and interpretation of results. Each assignment is worth 6 points (maximum 36 points for 6 assignments).

Final report

A final homework assignment will involve data analysis and paper preparation. The paper should contain the following sections: Introduction, Methods, Results, Discussion, and References. Results should be presented in an organized fashion, such as in table or graphical formats. Computer outputs should be edited to eliminate irrelevant or redundant material. The quality of the report will be judged by the suitability of methods, correct computing, interpretation of results, and clarity of presentation (maximum 40 points).

AI tools

You may use generative AI tools in this course. However, if you employ them to generate ideas, partial answers, draft or final text for any assignment, you must declare their use. Please also add a couple sentences detailing the extent of their use. You must save any generated text in case requested.
PREPARATION

The student is expected to be prepared for topics discussed in class. Sufficient time should be allocated for reading of required and assigned texts, watching video lectures.

LEARNING MATERIALS

Video lectures:

Course videos are available here http://tiny.cc/CWBsobor

Class road maps:

To help you navigate the course material, I have prepared road maps for each class. There you will find the learning objective for each class, suggested literature, brief summaries and chapters of each video: http://tiny.cc/CWBRM

Lecture slides and handouts of lab tutorials

Selected articles and book chapters:


Further readings:

UNIVERSITY POLICY

UBC and all Members of the UBC Community share responsibility for ensuring and maintaining an environment that is free from Discrimination. UBC regards Discrimination as a serious offence that is subject to a wide range of remedial or disciplinary measures, including dismissal or expulsion from UBC. (https://universitycounsel.ubc.ca/policies/discrimination-policy/)

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

SPPH is committed to providing a positive education experience free from discrimination. If you have had an experience in this course where you feel unsafe, have been mistreated or have witnessed mistreatment, please let us know. If you want to raise this beyond the course instructor, the School recommends the following. You may contact your academic supervisor, the education manager for your program or the Associate Director-Education. You may also report your concerns to the Faculty of Medicine Office of Respectful Environments, Equity, Diversity & Inclusion (REDI) at https://mistreatmenthelp.med.ubc.ca/. Both SPPH and the REDI Office have procedures in place for recording and acting on reports of mistreatment in the educational environment.