Course description: An introduction to modern methods for causal inference

1.5 cp doctoral level

November 6-10 2017

(undervisningsdagar 6-8 nov, självständigt arbete med examinationsuppgiften 9-10 nov)

Course leader:

Linda Magnusson Hanson, phone 08-55378916, email: linda.hanson@su.se

Teachers:

Naja Hulvej Rod, Copenhagen University, email: nahuro@sund.ku.dk

Per Kragh Andersen, Copenhagen University, email: pka@biostat.ku.dk

Course administrator:

Monika Karlsson, phone 08-163864 email:

Examinator:

Linda Magnusson Hanson phone: 08-55378916, email: linda.hanson@.su.se

Language: English

Course level: Doctoral level

Eligibility criteria: accepted for studies at doctoral level within social sciences including public health

Main field of study: Psychology

Host department: Department of Psychology, Stockholm University

Sign up: via email to SSC graduate school coordinator Claudia Bernard Oettel cbl@psychology.su.se

Course content

Causal inference is the ultimate goal of most epidemiological studies based on observational data. This course gives an applied introduction to modern methods of causal inference that may help answer causal questions. The course covers a general discussion on how to phrase causal questions and critically evaluate the underlying assumptions. The course will also provide a range of tools to address causality. These tools will include Directed Acyclic Graphs [DAGs], which is a rigorous and accessible tool for understanding and solving complicated causal problems, and analytical methods such as Inverse Probability of Treatments Weighs and G-estimation in simple and model based settings. The course is given as 1.5 credit points module. The first part of the course will introduce counterfactual thinking, which is central to modern methods for causal inference, and how the method of directed acyclic graphs can help in assessing problems with confounding, selection bias and information bias in empirical work. This part will partly be centered on the students' own research. The second part of the course will focus on g-formula and Inverse Probability of Treatments Weighting. The analytical methods will be illustrated using the R software.

Expected learning outcomes

A the end of the course, the student is expected to be able to

- Identify causal questions and critically reflect on the assumptions underlying causal conclusions in epidemiology
- Utilize the method of Directed Acyclic Graphs to discuss causal assumptions and identify confounding based on a proposed conceptual model
- Discuss the basic notation and models used in the causal inference literature
- Describe the basic principles of Inverse Probability of Treatment Weighs and G-Estimation and identify situations when these techniques are applicable to answer causal questions

Learning environment

Lectures and group discussions. Lectures is given over three days, prior to which the students are expected to read selected sections of the course literature on their own. For the second part of the course it is advantageous if the participants have access to R on their personal computers. Upon completion of lectures and exercises, the students will have time to work on an individual assignment that will be handed out as part of the examination and that can be handed in after the course days (exact day will be announced prior to the course).

Examination

There will be a take-home assignment handed out at the end of the lectures Nov 8. The assignment will consist of exercises similar to the ones discussed during class.

Grade and grade criteria

The course is grade on a pass/fail basis:

For a passing grade, the doctoral student should have completed the individual assignment and thereby shown that the expected learning outcomes are achieved.

For a failing grade, the student has not solved the assignment adequately and thus failed to show that the expected learning outcomes are met.

Course literature

Hernán MA, Robins JM (2017). Causal Inference. Boca Raton: Chapman & Hall/CRC, forthcoming. Accessible at https://www.hsph.harvard.edu/miguel-hernan/causal-inference-book/

Part I

Chapter 1 page 3-12 (10 pages)

Chapter 2 pages 13-24 (12 pages)

Chapter 3 pages 25-40 (16 pages)

Chapter 6 pages 69-82 (14 pages)

Chapter 7 pages 83-94 (12 pages)

Chapter 8 pages 95-108 (14 pages)

Part I

Chapter 11 pages 3-9 (7 pages)

Chapter 12 Pages 11-20 (10 pages)

Chapter 13 Pages 23-29 (7 pages)

In total 102 pages