DEPARTMENT OF MEDICAL EPIDEMIOLOGY AND BIOSTATISTICS

C8F2416, Causal Inference for Epidemiologists, 1.5 credits (hec)

Kausal inferens för epidemiologer, 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus was approved by The Committee for Doctoral Education on 2023-10-31, and was last revised on 2026-09-08. The revised course syllabus is valid from spring semester 2027.

Responsible department

Department of Medical Epidemiology and Biostatistics, Faculty of Medicine

Prerequisite courses, or equivalent

The students are expected to have taken Epidemiology I, Epidemiology II, Biostatistics I, and Biostatistics II. Exceptions can be made if the students have taken other courses with an equivalent content.

Purpose & Intended learning outcomes

Purpose

This course aims to present causal theory and introduces how concepts and methods can be understood within a general methodological framework.

Intended learning outcomes

After the course the student will be able to:

- use counterfactuals to express and interpret causal queries
- judge when standard statistical methodology is appropriate for causal inference, and when it is not
- use Directed Acyclic Graphs to describe and analyze complex epidemiological scenarios
- use Instrumental Variables to analyze observational data, with additional help from a skilled statistician.

Course content

Causal inference from observational data is a key task of biostatistics and of allied sciences such as sociology, education, behavioral sciences, demography, economics, health services research, etc. These disciplines share a methodological framework for causal inference that has been developed over the last decades.

This course presents this unifying causal theory and shows how biostatistical concepts and methods can be understood within this general framework. The course emphasizes conceptualization but also introduces statistical models and methods for causal inference. Specifically, this course strives to a) formally define causal concepts such as causal effect and confounding, b) identify the conditions required to estimate causal effects, and c) use analytical methods that, under those conditions, provide estimates that can be endowed with a causal interpretation. The (causal) methods can be used under less restrictive conditions than the traditional statistical methods. For example, Instrumental Variable methods allow one to estimate the causal effect of an exposure in the presence of unmeasured confounders of the exposure and outcome.

Forms of teaching and learning

Lectures and group discussions.

Language of instruction

The course is given in English

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

The individual examination (summative assessment).

Forms of assessment

The course grade is based on the individual written examination (summative assessment).

Students who do not obtain a passing grade in the first examination will be offered a second examination occasion within two months of the final day of the course. Students may be granted additional examination sessions, up to six in total, subject to discussion with and approval by the examiner.

Course literature

Recommended:

- Hernán MA, Robins JM (2020). Causal Inference: What If. Boca Raton: Chapman &

Hall/CRC. http://www.hsph.harvard.edu/faculty/miguel-hernan/causal-inference-book/

- Slides to be handed out during the course.