DEPARTMENT OF MEDICAL EPIDEMIOLOGY AND BIOSTATISTICS

C8F5577, Extensions to the Design and Analysis of Controlled Epidemiological Studies, 1.5 credits (hec)

Förlängning av design och analys av kontrollerade epidemiologiska studier, 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus was approved by the The Committee for Doctoral Education on 2023-12-13, and was last revised on 2024-02-29. The revised course syllabus is valid from autumn semester 2024.

Responsible department

Department of Medical Epidemiology and Biostatistics, Faculty of Medicine

Prerequisite courses, or equivalent

Epidemiology I, Introduction to epidemiology; Epidemiology II, Design of epidemiological studies; Biostatistics I, Introduction for epidemiologists; Biostatistics II, Logistic regression for epidemiologists; and Biostatistics III: Survival analysis for epidemiologists, or equivalent courses

Purpose & Intended learning outcomes

Purpose

This course aims to enable practicing epidemiologists to make more efficient use of already-available epidemiological data, and to design studies that are more efficient and that will extend possibilities for future analysis.

Intended learning outcomes

After successfully completing this course you as a student are expected to be able to:

- select a suitable epidemiological design for addressing a specified research question and justify the choice of design compared to other options.
- compare the risk estimates obtained by different sampling strategies from the same underlying

cohort and interpret these estimates for common designs.
- describe the benefits/limitations of matched designs and approaches to analysis of matched data.
- compare and contrast the purpose of time-matching and confounder-matching in (nested) case-control studies, and generalise the resulting risk sets to a wide range of standard and non-standard designs.
- compute weights that enable the reconstruction of an underlying study base from a (nested) case-control sample and recognise that two-stage designs, extended/extreme designs and reused case-control data, can all be analysed using appropriate weights to reflect the sampling
- discuss the designs of published studies with particular attention to the choice of controls and devise more efficient alternatives.

Course content

The overall aim of this course is to present more flexible and informative approaches to the design and analysis of epidemiological studies, in order to make efficient use of costly data. The course will introduce methods for designing more efficient studies that exploit available population data and/or reuse data from prior studies conducted in well-defined cohorts (such as national registers). The focus will be on different sampling designs in terms of their (biased) representation of the underlying cohort, and how to reconstruct the correct numbers at-risk to produce unbiased parameter estimates, including several important quantities (other than the odds ratio). The course will demonstrate how (i) extended efficient designs can be analysed with standard methods, and (ii) extended methods of analysis can provide additional estimates from standard designs.

Forms of teaching and learning

Lectures interspersed with tutorials consisting of workshops and journal club sessions. In the workshops, participants will develop and refine a study design to address a clinical/epidemiological research question which will be presented and discussed. Journal clubs will consist of discussion and debate concerning key papers that will be assigned.

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

Forms of assessment

The course grade will be based on a take-home assignment involving a proposed epidemiological study. The participant will submit a short, written report and an oral presentation where they will present and defend their proposal. A passing grade must be obtained for both the written and oral section in order to obtain a passing grade for the course. Students who do not obtain a passing grade on one of these sections will be allowed to revise that part of their work and be re-examined under the same conditions. The exam will have a strong emphasis on intuitive understanding and ability to explain/communicate rather than on technical or mathematical detail. The take-home examination will be explained on the first day of the course, assigned on the last day, and due within ten days of the end of the course. Students who do not obtain a passing grade in the first examination will be offered a second examination within 2 months of the final day of the course.

Course literature

Suggested course literature:
The course is based on a textbook by the instructor, involving material from several decades of scientific publications concerning epidemiological designs:
https://www.routledge.com/Controlled-Epidemiological-Studies/Reilly/p/book/9780367186784

All participants will be asked to read Chapters 1, 2 and 4 (assumed to be familiar material) before the course, together with the key papers 1-5 below. The course will be based mostly on the methods and exercises from Chapters 6- 9 of the textbook, including applications to data sets available at: https://www.meb.ki.se/biostat/CES.htm. Stata and R code will be provided for the laboratory sessions.

1. Pearce N. Classification of epidemiological study designs. Int J Epidemiol 2012;41:393–397
2. Vandenbroucke JP, Pearce N. Case-control studies: basic concepts. Int J Epidemiol. 2012 Oct;41(5):1480-9.
3. Knol MJ, Vandenbroucke JP, Scott P, Egger M. What do case-control studies estimate? Survey of methods and assumptions in published case-control research. Am J Epidemiol. 2008 Nov 1;168(9):1073-81.
4. Mansournia MA, Hernán MA, Greenland S. Matched designs and causal diagrams. Int J Epidemiol. 2013 Jun;42(3):860-9.
5. Borgan O, Samuelsen SO. A review of cohort sampling designs for Cox regression model: potentials in epidemiology. Norsk Epi. 2003, 13(2), 239-248.
6. Spiegelman D, Rivera-Rodriguez CL, Haneuse S. Evaluating Public Health Interventions: 3. The Two-Stage Design for Confounding Bias Reduction-Having Your Cake and Eating It Two. Am J Public Health. 2016 Jul;106(7):1223-6.
7. Kim RS. A new comparison of nested case-control and case-cohort designs and methods. Eur J Epidemiol., 30:197-207, 2015.
8. Suissa S. The Quasi-cohort approach in pharmacoepidemiology: upgrading the nested case-control. Epidemiology. 2015 Mar;26(2):242-6.
9. Delcoigne B, Colzani E, et al. Breaking the matching in nested case-control data offered several advantages for risk estimation. J Clin Epidemiol. 2017 Feb;82:79-86.
10. Arnold BF et al. Brief Report: Negative Controls to Detect Selection Bias and Measurement Error in Epidemiologic Studies. Epidemiology 2016, 27(5):637-41.