



DEPARTMENT OF MEDICAL EPIDEMIOLOGY AND BIostatISTICS

C8F6113, Applied Longitudinal Data Analysis, 1.5 credits (hec)

Tillämpad longitudinell dataanalys, 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus was approved by The Committee for Doctoral Education on 2026-02-16, and is valid from autumn semester 2026.

Responsible department

Department of Medical Epidemiology and Biostatistics, Faculty of Medicine

Prerequisite courses, or equivalent

Knowledge in epidemiology and biostatistics equivalent to "Epidemiology I: Introduction to epidemiology", "Biostatistics I: Introduction for epidemiologists" and "Biostatistics II: Logistic regression for epidemiologists" or corresponding courses.

Purpose & Intended learning outcomes

Purpose

The course gives an introduction to modern methods for the analysis of longitudinal and repeated measures studies which are commonly used in epidemiological studies and in clinical trials.

Intended learning outcomes

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

- Identify appropriate methods to analyze longitudinal data in a variety of settings and with a variety of types of outcome variables.
- Analyze a scientific problem that requires repeated measurements, identify an appropriate design, and identify the statistical methods required to analyze the data.
- Interpret output from longitudinal analyses of data generated from randomized and observational studies with repeated measures designs.

- Apply modern methods for the analysis of longitudinal data to a range of settings encountered in biomedical and public health research.
- Interpret and communicate the clinical/scientific meaning of the results of a longitudinal analysis.

Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

Course content

The course gives an introduction to modern statistical methods for the analysis of longitudinal data which are commonly used in epidemiological studies and in clinical trials. The defining feature of a longitudinal study is that measurements of the response are taken repeatedly through time on the same individuals. The primary goal of a longitudinal study is to characterize an outcome (and potentially change in that outcome over time) and the factors that influence the outcome (and its change). A feature of longitudinal data that complicates the analysis is the often positive correlation (i.e., lack of independence) among repeated observations and possible heterogeneity of variability across measurement occasions.

The course covers the following topics: features of longitudinal data, formal notation, modeling the mean response (analysis of response profiles, parametric and semi-parametric trends), modeling the covariance, growth curves (trajectories), fixed effects models, and mixed effects models (that include random effects). This course is focused on general regression models for longitudinal data when the response variable is either continuous (linear models) or discrete (e.g., binary or count data that require logistic and Poisson models). Topics covered in the course will include: introduction to generalized linear models, extensions of generalized linear models to longitudinal data, marginal models and generalized estimating equations (GEE), random effects models for continuous and categorical data (generalized linear mixed models), and contrasting marginal and mixed effects models.

Forms of teaching and learning

Lectures, computer labs with exercises focusing on the analysis of sample datasets using statistical software, group discussions, literature review.

Language of instruction

The course is given in English

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

The individual written examination (summative assessment).

Forms of assessment

To pass the course, the student has to show that the learning outcomes have been achieved. Assessments methods used are based on group assignments (formative assessments) and an individual written examination (summative assessment). The focus will be on understanding of the concepts and their application to analysis of epidemiological studies, rather than mathematical details. The examination is viewed as contributing to the development of knowledge, rather than a test of knowledge.

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 reading:

Fitzmaurice GM, Laird NM, Ware JH. Applied Longitudinal Analysis, 2nd Ed. Wiley & Sons, 2011

Selected chapters of Jewell NP, Hubbard A, Heggseth, B, Analysis of Longitudinal Studies in Epidemiology, 2026 (see <https://www.schulthess.com/buchshop/literatur/detail/ISBN-9781584885047/Jewell-Nicholas-P.-Hubbard-Alan/Analysis-of-Longitudinal-Studies-in-Epidemiology> or <https://www.ernster.com/en/detail/ISBN-9781584885047/Hubbard-Alan/Analysis-of-Longitudinal-Studies-in-Epidemiology>)

Other information

Replacing syllabus C8F2798.