Bayesian methods in Epidemiology
Monday and Friday 10:15 - 12:00 am, Kräftriket, House 5, Room 32

Course Description: This course is intended to cover aspects of Bayesian statistical methods in application to problems in epidemiology. The course aims to cover a range of basic biostatistical topics such as linear, logistic and log-linear regression modeling, longitudinal data and survival data analysis. Markov chain Monte Carlo sampling will be treated and R with the JAGS software will be used for model fitting and analysis.

Objectives of the course: By the end of this course, students will have a basic understanding of the methods of Bayesian Analysis and their application to relevant problems in epidemiology, have an understanding of computational approaches to fit Bayesian models, and be able to use JAGS for the development and analysis of Bayesian biostatistical problems.

Prerequisites: It is assumed that the student has taken one basic course in probability theory and at least a theoretical course in statistics (inference) and in linear models. Basic knowledge of R will be an advantage.

Examination: The students will be evaluated on the basis of two home assignments that have to be solved individually. The first assignment will be handed out on December 5th and should be returned by December 22nd. The second one will be distributed at the end of the last lecture (December 19th) and should be returned by the end of January. This course is a 5 credits PhD course.

The course may also be taken as second part of the 7.5 credits master course MT7030 "Selected topics in biostatistics" ("Valda ämnen i biostatistik"). The first part is taught by Ola Hössjer in November. The final grade (A-F) on MT7030 is a weighted average of the two grades from each part.

Course Schedule:

NOV 28	Introduction to Bayesian statistics: likelihood; prior distribution; posterior distribution; conjugacy; predictive distribution. Bayesian computation: posterior sampling, Markov chain Monte Carlo.
DEC 1	Introduction to regression models: linear and generalized linear models, mixed models. Examples from case-control studies, cross-sectional studies and meta-analysis in epidemiology.
DEC 5	Software to perform Bayesian analysis: exercises in R and introduction to the BUGS language.
DEC 8	Modeling longitudinal data: theory and examples from cohort studies in epidemiology.
DEC 12	Modeling longitudinal data: exercises in R and JAGS.
DEC 15	Modeling survival data: theory and examples from cohort studies in epidemiology.
DEC 19	Modeling survival data: exercises in R and JAGS.

Course material: All course material will be posted on the course website. Useful references are:

Lesaffre, E., and Lawson, A. B. (2012). *Bayesian biostatistics.* John Wiley & Sons.
Carlin, B. P. and Louis, T. A. (2009). *Bayesian Methods for Data Analysis.* CRC Press.
Congdon, P. (2003). *Applied bayesian modelling.* John Wiley & Sons.

Software: R, JAGS.

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Office Hours: Monday 13:00-15:00 PM and by appointment.