



Applied Bayesian Statistics in Medical Research

January 22-24, 2015

Faculty

Prof. Marcel Zwahlen, PhD, and Dr. Sandro Gsteiger, PhD
Institute of Social and Preventive Medicine (ISPM), University of Bern, Switzerland
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Place

Room Bühlstube, Wengen (see map on <http://www.epi-winterschool.org/hotels>)

Introduction

The Bayesian approach to medical research offers a powerful framework allowing for the incorporation of externally available information. Although Bayesian statistics is sometimes perceived and discussed as controversial, this course is not about controversies, but about pragmatic ways of integrating available information in a coherent way in analyses of epidemiological and clinical studies. The course builds on applied problems and exercises. It is aimed at epidemiologists, statisticians and others who wish to use Bayesian approaches. Participants should have a good understanding of basic statistical and epidemiological principles and be able to interpret parameters and results from standard data analyses.

Course objectives

- To understand the role of Bayesian statistics in clinical research and health-care evaluation.
- To introduce computational tools for Bayesian analysis.
- To highlight challenges and dangers of naïve use of Bayesian methods.
- To provide the basis for a unified statistical approach that allows approaching problems of analysis and design in a structured way.

What you have to bring

Students will bring their own portable computers. Prior to the course, we will provide instructions regarding the installation of the software packages that will be used in the course. These are R (<http://www.r-project.org/>) and JAGS (<http://mcmc-jags.sourceforge.net/>) which are both freeware. JAGS (Just Another Gibbs Sampler) is a cross-platform engine for the BUGS language with distributions for Mac OS X, Windows, and Linux. Other tools such as WinBUGS or OpenBUGS will not be used in this course.

Outline of course

The course will run over three days and consists of a mixture of lectures and computer practicals. During the extended break in the afternoon, participants review course materials, catch up on emails or go skiing.

Thursday, January 22nd (8:30 – 12:00 | 17:00 – 19:00)

- Introduction to Bayesian methods: basic principles, probabilities
- Inference for binary data and making predictions for binary data
- Computer practicals:
 - on handling probabilities and Bayesian inference for binary data
 - on predictions on number of successes in additional N patients

Friday, January 23rd (8:30 – 12:00 | 17:00 – 19:00)

- Bayesian Inference for Normal Data
- Introduction to simulation-based Bayesian analysis (Markov Chain Monte Carlo algorithms) and running Generalized Linear Models (GLM) in JAGS
- Computer practicals:
 - on the analysis of normal data and running JAGS
 - on estimating prevalence, sensitivity, specificity in situations in which two different diagnostic tests are used and no gold-standard is available (in JAGS)

Saturday, January 24th (8:30 – 12:00 | 17:00 – 19:00)

- Bayesian approaches to evidence synthesis and meta-analysis and how to quantify the amount of historical information
- Issues when incorporating prior information
- Computer practicals on quantifying historical information
- Question and answer session, and feedback on the course

Credit

1.5 ECTS

Maximum number of participants

The maximum number of participants on this course will be 18.

Course fee

Academic: CHF 900

Industry: CHF 1800

Registration

Registration on the Winter School website www.epi-winterschool.org.

Course hotels

The participants have to book their accommodation themselves (see map and recommendation on www.epi-winterschool.org/hotels).

