

Swiss Epidemiology Winter School 2014



Applied Bayesian Statistics in Medical Research (ws14-5)

January 23-25, 2014

Faculty

Prof. Marcel Zwahlen, PhD, Dr. Sandro Gsteiger, PhD

Institute of Social and Preventive Medicine (ISPM), University of Bern, Switzerland

Dr. Beat Neuenschwander, PhD

Head, Statistical Methodology, Novartis Oncology, Basel, Switzerland

Introduction

The Bayesian approach to medical research offers a powerful framework allowing for the incorporation of new information as it accrues. 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 epidemiological analyses. The course builds on applied problems and exercises and 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

- 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

- 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

- 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

Maximum number of participants

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

Course fee

Academic: CHF 900
Industry: CHF 1500

Course hotels

See www.epi-winterschool.org