TEL AVIV UNIVERSITY אוניברסיטת תל אביב

School of Public Health

Summer Institute of Advanced Epidemiology and Preventive Medicine

Bayesian Methods in Clinical Research

July 9-13 2017 | Course No. 0158.1265

Course Instructor:	Emmanuel Lesaffre (LU)
Date & Time:	July 9-13 2017 | 8:30-14:00
Final Exam:	July 14, 2017 | 9:00-11:00
Location:	Sackler Faculty of Medicine, Tel Aviv University

Pre-requisites & Intended Audience

Knowledge of various regression models: linear regression, logistic/probit regression, survival models, and if possible hierarchical models. A familiarity with R is required.

The course is intended for Master's and PhD level students or above.

Academic Credit & Course Requirements

2 Academic Credits (4 ECTS). Participants must pass the final exam with a grade of 60 (D). Noncredit participants will receive a certification of participation and are not required to take the final exam, but are expected to participate in team workshop and presentations.

Recommended Reading

Lesaffre and Lawson (2012) Bayesian Biostatistics, Wiley & Sons

Course Description

In the last two decades the Bayesian approach has become increasingly popular in virtually all application areas. The approach is especially known for its capability to tackle complex statistical modeling tasks. The aim of this course is to introduce the participants smoothly into Bayesian statistical methods, from basic concepts to hierarchical models, model building and model testing. Numerous biostatistical examples (e.g. meta-analyses, longitudinal studies including growth curve modelling, analysis of clinical trials, etc) illustrate the theoretical concepts. The course is scheduled into classroom teaching and computer exercises, and uses the software packages WinBUGS and OpenBUGS but also their interfaces with R making use of R2WinBUGS and R2OpenBUGS. The course is based on a recently published Wiley book of Lesaffre and Lawson, entitled Bayesian Biostatistics.

Instructor Bio

Dr. Lesaffre is Professor of Biostatistics at the KU Leuven and U Hasselt in Belgium. He was also chair of the department of Biostatistics at Erasmus MC, Rotterdam, the Netherlands from 2007 to 2014. He now holds a honorary professorship at the University of Erasmus. He studied mathematics at the University of Antwerp, and received his Doctorate of Science at KU Leuven in 1986. The statistical research of Dr. Lesaffre deals with hierarchical and clustered data with a focus on longitudinal studies, interval censoring, missing data problems, Bayesian methods and in general statistical methods in clinical trials. He has worked in a great variety of medical applications, with focus on research in oral health, cardiology and nursing studies. Dr. Lesaffre is the founding chair of the Statistical Modeling Society, and is past-president of the International Society of Clinical Biostatistics. In addition he started up a bi-annual international conference on statistical methods in oral health. He is one of the three founding editors of Statistical Modeling and has been Associate Editor of Biometrics, and

is currently Associate Editor of Biostatistics. He was elected Fellow of the American Statistical Association and is an honorary member of the Society of Clinical Biostatistics. He has published over more than 400 papers in major statistical and clinical peer-reviewed journals. He has written/edited over five books and two books in preparation.

Course Timetable

Sunday, July 9 (Day 1)	
08:30-08:45	Introductions
08:45-10:30	A reflection on classical frequentist statistics and the likelihood function **Lecturer: Emmanuel Lesaffre**
10:30-11:00	Break
11:00-13:00	Introduction to Bayes theorem and the posterior distribution **Lecturer: Emmanuel Lesaffre**
13:00-14:00	Practical session: Use of R to compute posterior distribution **Lecturer: Emmanuel Lesaffre**
Monday, July 10 (Day 2)	
08:30-09:00	What have we learned up to now? **Lecturer: Emmanuel Lesaffre**
09:00-10:30	Posterior summary measures and the predictive distribution **Lecturer: Emmanuel Lesaffre**
10:30-11:00	Break
11:00-12:00	Numerical techniques to determine the posterior distribution **Lecturer: Emmanuel Lesaffre**
12:00-14:00	Practical session: Use of R to compute posterior summary measures and distribution **Lecturer: Emmanuel Lesaffre**
Tuesday, July 11 (Day 3)	
08:30-09:00	What have we learned up to now? **Lecturer: Emmanuel Lesaffre**
09:00-10:00	More than one parameter – Bayesian linear regression **Lecturer: Emmanuel Lesaffre**
10:00-10:30	Introduction of Markov Chain Monte Carlo techniques – part I **Lecturer: Emmanuel Lesaffre**
10:30-11:00	Break
11:00-12:00	Introduction of Markov Chain Monte Carlo techniques – part II **Lecturer: Emmanuel Lesaffre**
12:00-14:00	Practical session: Use of Win/OpenBUGS to sample from posterior distribution **Lecturer: Emmanuel Lesaffre**

Wednesday, July 12 (Day 4)	
08:30-09:00	What have we learned up to now? **Lecturer: Emmanuel Lesaffre**
09:00-10:00	Choosing the prior **Lecturer: Emmanuel Lesaffre**
10:00-10:30	Bayesian hierarchical models **Lecturer: Emmanuel Lesaffre**
10:30-11:00	Break
11:00-12:00	Model selection and model checking **Lecturer: Emmanuel Lesaffre**
12:00-14:00	Practical session: Use of R2Win/OpenBUGS for hierarchical models **Lecturer: Emmanuel Lesaffre**
Thursday, July 13 (Day 5)	
08:30-08:45	What have we learned up to now? **Lecturer: Emmanuel Lesaffre**
08:45-10:15	Diagnostic testing **Lecturer: Emmanuel Lesaffre**
10:15-10:30	Break
10:30-11:30	Practical session: Use of R2Win/OpenBUGS for diagnostic testing **Lecturer: Emmanuel Lesaffre**
11:30-12:30	Meta-analysis **Lecturer: Emmanuel Lesaffre**
12:30-13:30	Practical session: Use of R2Win/OpenBUGS for meta-analysis **Lecturer: Emmanuel Lesaffre**
13:30-14:00	Certificate ceremony and class photo
Friday, July 14 (Final Exam)	
09:00-11:00	Sackler Faculty of Medicine