



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



Mathematical Modelling in Infectious Disease Epidemiology (ws13 - 4)

January 24 - 26, 2013

Faculty

Prof. Sebastian Bonhoeffer, PhD

Institute of Integrative Biology, ETH Zurich, Switzerland

Dr. Christian Althaus, PhD (course co-ordinator) and Prof. Nicola Low, MD

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

Introduction

Modelling of the dynamics of infectious diseases is becoming increasingly important for improving understanding about transmission and the potential impact of public health interventions. In this course, students will be introduced to the basic concepts of mathematical modelling of infectious diseases such as the basic reproductive number, R_0 . We will discuss issues such as vaccination thresholds, stochastic effects during epidemic growth and sexual networks. Students will be able to work on real-life applications of infectious disease modelling with case studies of influenza and chlamydia, a bacterial sexually transmitted infection. Exercises will be conducted in the programming language R. Previous knowledge of R is useful but not essential.

Course objectives

- To understand the role of infectious disease dynamics for research, health care and public health decision making
- To become familiar with the basic concepts of mathematical models of infectious diseases
- To use simple mathematical models to study disease transmission and control interventions

What you have to bring

Students will bring their own laptops. The R software environment for statistical computing should be pre-installed or can be installed on arrival. R runs on Windows, Mac OS X and Linux and can be freely downloaded at <http://www.r-project.org>.

Outline of course

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

Thursday

- Introduction to mathematical epidemiology
- Basic concepts of population dynamics (exponential growth, death)
- Compartmental models (SEIRS; susceptible-exposed-infected-recovered)
- Basic reproduction number R_0
- Computer exercises: Getting started with R, simulating an influenza epidemic, exploring the impact of vaccination

Friday

- What are stochastic effects and when are they important?
- Simulating stochasticity
- Computer exercises: Investigating stochastic effects during an infection outbreak

Saturday

- Sexually transmitted infections (STIs) and sexual contact networks
- Individual-based models
- Computer exercises: Studying the spread of STIs in sexual contact networks

Maximum number of participants

The maximum number of participants on this course will be 20.

Course venue

Hotel Edelweiss (10 minutes walking distance from Sunstar Hotel)

Course hotels

Course participants will stay either at Hotel Edelweiss or Sunstar Hotel in Wengen. See www.edelweisswengen.ch or <http://wengen.sunstar.ch> for details on the hotels.

Course fee and hotel costs

Course fee: CHF 500

Hotel Edelweiss (including breakfast buffet and four-course dinner, sauna, transfer from/to train station):

Arrival January 23, departure January 27 (four nights)

Single occupancy CHF 460.-

Double occupancy CHF 460.-

Triple occupancy CHF 400.-

Quadruple occupancy CHF 400.-

Sunstar Hotel (including breakfast buffet and four-course dinner, transfer from/to train station free use of swimming pool, sauna and stem bath):

Arrival January 23, departure January 27 (four nights)

Single occupancy CHF 600.-

Double occupancy CHF 560.-

Please note that the hotel bill will have to be settled by each participant upon departure.