

MI200: Getting Started With Bayesian PK-PD Modeling & Simulation Using WinBUGS (1 CR)

MI200 provides an introduction to Bayesian modeling and the practical use of WinBUGS for PK-PD applications. Participants may apply the 1 credit hour from this course to the Metrum Institute Certificate Program in Pharmacometrics.

Instructor

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Independent Study

For more information, please see the [Metrum Institute Independent Study Course Policy](#).

Prerequisites

Experience with PK-PD modeling and some familiarity and hands-on experience with nonlinear regression, mixed-effects modeling, and use of R (or S-PLUS). Applicable MI courses include: MI205, formerly MI220, or contact us: info@metruminstitute.org.

Computer Hardware/Software

This course requires a Windows laptop computer with a web browser. All required software used for hands-on examples will be freeware/open-source software and simple instructions will be provided for users to download from the course site OR request a preloaded USB drive.

Fees

Regular registration: \$1000 USD / Academic & government registration: \$500 USD

Course Outline

1. Introduction to Bayesian statistical principles and methods
 - Bayes' Rule
 - Bayesian modeling & inference process
2. Computation for Bayesian modeling
 - Key challenge of Bayesian modeling and inference: high-dimensional multiple integration
 - General computational approach: posterior simulation
 - Brief intro to Markov chain Monte Carlo simulation
3. WinBUGS basics
 - What is it?
 - How do I get it?
 - How do I run it?
 - WinBUGS demo: Linear regression
4. Introduce PK-PD modeling case study to be used throughout the course
5. Hands-on example 1: Simple nonlinear regression, e.g., a PK-PD model relating a single exposure metric to a single continuous PD outcome
6. Topics in Bayesian model development using WinBUGS I
 - Using WinBUGS scripts
 - R tools for running WinBUGS and analyzing MCMC simulations
 - Assessing convergence
 - Programming hierarchical models (aka mixed effect or population models)
7. Hands-on example 2: Nonlinear mixed effects, e.g., a PK-PD model relating observed drug concentrations to continuous PD measurements at the same time
8. Topics in Bayesian model development using WinBUGS II
 - BUGSModelLibrary for pharmacometric modeling: Introduction & demonstration
 - Dealing with censored data in WinBUGS
9. Hands-on example 3: Population PK.
10. Additional topics & closing discussion
 - Considerations in deciding whether to use Bayesian modeling with WinBUGS versus maximum likelihood modeling with NONMEM® (or other ML tools)
 - What didn't we cover?