Animal Agriculture and Food Safety Risk Analysis and Disease Modeling

EpiX Analytics and RVC, London, UK, 2016

Course program

Please remember to review the basic study material provided here before attending the course

Five-day course:

Day 1	**Introduction & Fundamental stochastic processes**
Morning	**Welcome and General Introduction** **Introduction to risk analysis in epidemiology and food safety** • Frameworks (OIE, Codex) & principles • Qualitative, semi-quantitative and quantitative approaches • Risk management and risk communication **Short refresher: statistical foundations and risk modeling** • Fundamentals of probability distributions • Probability theory refresher • Graphical representations of risk events • Monte Carlo simulation, Excel add-ons (@RISK®) and R® • Calculation vs. simulation • Typical risk analysis results, their presentation and interpretation
Afternoon	**Fundamental stochastic processes: Binomial process** • Binomial & beta distributions - optional: BetaBinomial, negative binomial, and geometric • Practical problems to solve • Discussion / examples ***Social event in Camden***
Day 2	**Fundamental stochastic processes (cont.)**
Morning	**Poisson process** • Poisson, gamma, exponential distributions - optional: Erlang, Polya, and Delaporte • Practical problems to solve **Central limit theorem** **Useful identities and approximations**

Afternoon	**Determining distributions from data / distribution fitting** • Checking data quality and appropriateness • How to accept and reject different data sets • How to use reported data in risk assessment models • Statistical methods to fit distributions to data • Combining data sources and/or expert opinion: mixture distributions and meta-analysis • Problems to solve
Day 3	**Modeling parameter and model uncertainty**

Morning	**Bayesian statistics**
	• Theory and derivation, comparison with classical statistical and Bootstrap methods
	  o Example: modeling *p* when no events are observed (zero-numerator)
	• Posterior construction and simulation
	  o Conjugate priors, discrete approximations, Bayesian Monte Carlo, MCMC, Likelihood-free methods (ABC)
	• Applied MCMC and WinBUGS/OpenBUGS modeling
	  o Example application: using latent-class analysis for imperfect diagnostic tests in a risk assessment model

Afternoon	**Classical statistics** • Using classical statistical inference and tests to model uncertainty about population parameters • Mean, SD/SE, prevalence, incidence • Limitations **The bootstrap** • Non-parametric and parametric Bootstrap techniques • Using the bootstrap to model correlations **Applications and practical problems to solve**
Day 4	**Special topics in Epidemiology and Food Safety**
Morning	**Principles of food safety modeling** • Farm to fork vs. empirical and risk attribution models • Exposure assessment – principles in microbial and chemical food safety, food consumptions databases and limitations **Dose-response modeling** • Mechanistic vs. “curve fitting” and empirical models • Single-hit vs. threshold models • Mechanistic models: Logistic, Exponential, Beta-Binomial, Beta-Poisson, Weibull-Gamma, Gompertz • Other empirical models • Low dose extrapolation and its limitations
Afternoon	**Food safety modeling exercises** **Discussion of participants’ modeling problems** • Example case studies / relevant methods ***Social event in Camden***

Day 5	**Disease spread modeling** **Designing, reporting and maintaining a risk assessment**
Morning	**Introduction to disease spread modeling** • Dynamics of infectious diseases in populations, state transition diagrams, and basic disease parameters • Simple SIR and SEIR models • Extensions to the simple models: stochastic, spatially explicit models, multiple species/epidemiological populations • How to use disease spread models within a risk assessment • Practical problem: development of a stochastic model using Excel and @Risk and/or R
Afternoon	**Model design and validation** • Good practices in risk modeling: how to build and maintain a model (A-Z steps) • Risk analysis checklist, including common mistakes and their prevention **Delivery of certificates of attendance and adjourn**