Course program*: Epidemiology and Food Safety Risk Analysis

EpiX Analytics, Fort Collins, Colorado, USA

YOU ARE ENCOURAGED TO PREPARE FOR THE CLASS BY REVIEWING BASIC KNOWLEDGE AND COMPUTER COMMANDS IN R OR EXCEL DEPENDING ON THE TOOL YOU WILL BE USING DURING THE CLASS. EXERCISE WILL ONLY BE PRESENTED USING R, BUT @RISK SOLUTIONS WILL ALSO BE PROVIDED ELECTRONICALLY.

Day 1	**Welcome and General Introduction**
Morning	**Introduction to risk analysis in epidemiology and food safety** • Frameworks and guidelines • Qualitative, semi-quantitative and quantitative approaches • Main steps of a risk assessment • Communicating results **Statistical foundations** • Fundamentals of probability distributions and probability theory • Graphical representations of risk events
Afternoon	**Learning the software**
	Risk modeling in R • Basic R structures • Probability calculations • Simulation: Building efficient loops, vectorized calculations, when to simulate or calculate • Differences with @RISK **Group exercise – picking subject and setting up teams** ***Social event***
Day 2	**Stochastic processes and data**
Morning	**Binomial and hypergeometric process** • Binomial, BetaBinomial, and Negative binomial, Geometric, Hypergeometric, Inverse Hypergeometric • Modeling population prevalence, individual test interpretation, test properties
Afternoon	**Poisson process** • Poisson, gamma, and exponential • Modeling incidence, prediction of illnesses **Aggregate modeling, identities and approximations** **Group exercise – frame the problem and develop conceptual model**
Day 3	**Stochastic processes and data (cont.)**

Morning	**Case study - microbiological and/or toxicological QRA** **Determining distributions from data / distribution fitting** • 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
Afternoon	**Food-safety specific methods**
	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 • Chemical vs microbial DR **Group exercise – develop simple draft stochastic model**
Day 4	**Modeling parameter and model uncertainty**
Morning	**Bayesian statistics** • Theory and comparison with classical statistical and Bootstrap methods ○ Example: modeling *p* when no events are observed (zero-numerator) • Posterior construction and simulation • Conjugate priors, discrete approximations, Bayesian Monte Carlo, MCMC, Likelihood-free methods (ABC)
Afternoon	**Classical statistics** • Using classical statistical inference and tests to model uncertainty about population parameters **The bootstrap** • Non-parametric and parametric Bootstrap techniques • Using the bootstrap to model correlations **Group exercise – add data/uncertainty to model**
Day 5	**Communicating results**
Morning	**Case study – epidemiological risk assessment** **Correlations without causal driver** • Using copulas and rank order correlation **Final refresher:** risk analysis checklist, preventing mistakes, maintaining models.
Afternoon	**Group exercises** • Final group work and preparation of presentations • Presentation of groups results and open discussion with class **Delivery of certificates of attendance and adjourn**

*The program might be slightly modified based on relevance to audience.