

Description and program of the course “Applied Course in Quantitative Risk Modelling for Animal Health and Food Safety”

This course will provide an overview of the “risk concept” applied to animal health and food safety and how risk assessment is used to support a risk management decision. Participants will be introduced to different approaches related to the use of risk assessment such as import risk assessment and food safety risk assessment, with emphasis in microbiological risks. The focus of the course will be quantitative modelling and how data and probability distributions are used in risk assessment.

After the course the participants will be able to:

- i) frame questions related to animal health and food safety that can be assessed using quantitative probabilistic modelling
- ii) ii) creating risk pathways
- iii) iii) combining data and probability distributions
- iv) iv) estimate the risk at the end of the pathway using Monte Carlo simulation.

Targeted audience:

The course will be directed to graduate students, researchers, risk assessor and risk managers. Participants are encouraged to bring their own problems to work with during the course. In needed, the tutors will provide the participant with a problem to work on.

Expected preparation before the course:

- 1) To optimize the learning output for each participants, the participant can submit a description of their animal health or food safety issue they will work on during the course (own problem/case), including the goal of the management of the issue. The description should follow the guidelines below.
- 2) Installing the free EXCEL ad-on software “ModelRisk” (<https://www.vosesoftware.com/products/modelrisk/>) , and worked through the e-learning introduction provided under “FreeSoftware and Resources” on the ModelRisk webpage, and the e-leaning material provided by the tutor.
- 3) Watch three videos introducing the concept of risk assessment (will be distributed few weeks before course)

Pedagogical approach:

The program is structured into modules of about 45 min - 1 hour. Most modules starts with a short introduction of a new topic, including an example where the tutor illustrate how it is applied. During the course we will use few examples, making them more and more complex. After that, the students will apply the topic onto their own problem/case.

The focus of the course is that the participants learn how to initiate and perform a relatively simple stochastic risk assessment, using existing data and existing tools for stochastic modelling. For the stochastic modelling we use the EXCEL add in program ModelRisk, whereby the participants does not need to make any computer codes. For those with special interest coding in R, this is also possible.

Tentative schedule

Time	Lecture	Laboratory
Monday morning – introduction to risk assessment and modelling of risk		
8:30 – 9:15	Inductive introduction of risk assessment and decision processes – an example	
9:15 – 9.30	Introduction to the course and what participants can expect	
9:30– 10:00	What is hazard and risk in food safety and animal health	
Coffee break		
10:30 – 11:00		Own case 1: Outline the risk problem
11:00 – 12:00	Risk assessment, and how it is related to decision processes.	
		Own case 2: Outline the question you want to “answer”
Lunch break		
Monday afternoon – introduction to risk assessment models		
1:00 – 2:00	Introduction to an example assessing the risk related to Salmonella in pigs/pork	
		Own case 3: Qualitative description of risk pathway
2:00 – 3:00	Qualitative assessment of a risk	
		Own case 4: Qualitative assessment of your risk, including the assumptions
Coffee break		
3:15-3:30	International standards for risk assessment – FAO-WHO (Codex Alimentarius, food safety), OIE (animal health)	
3:30 - 4:00		Own case 5: Structure the assessment into the international standards
4:00 - 4:30	Model structure – modular processes; data driven versus mechanistic modelling.	
4:30 – 5:00		Own case 6: Describe the pathway in subsequent modules
Tuesday morning – quantitative modelling and probability		

8:30 – 9:00	Qualitative versus quantitative models for risk assessment	
9:00 - 9:30		Exercise 1: Qualitative and quantitative risk estimation
9:30 – 10:00	Introduction to quantitative data and measures	
Coffee break		
10:30 – 11:00	Probability theory, including conditional probability	
11:00 – 12:00	What is natural existing variation?	Own case 8: Identify sources of variation
Lunch break		
Tuesday afternoon – describing variation and uncertainty using probability distributions		
13:00 - 13:30	Qualitative and quantitative expression of variation	
13:30 – 14:00		Own case 9: Select and parametrized a probability distribution describing the variation
14:00 - 14:30	What is uncertainty and sources of uncertainties?	
14:30 – 15:00		Own case 10: Outline the different sources of uncertainty you have In your risk assessment
Coffee break		
15:15 – 5:00	Qualitative and quantitative expression of uncertainty – focus on binomial process	
		Own case 11: Select and parametrized a probability distributions describing uncertainties
Wednesday morning – estimating the probability of a negative consequence using Monte Carlo simulation		
8:30-9:30	Introduction to Monte Carlo simulation expressing variation – best case and worst case analysis v. Monte Carlo simulation	Exercise 2: Combining probability distributions of variation using Monte Carlo simulation
9:30 - 10:00	Combine probability distribution describing variations, and interpret the output?	
Coffee break		
10:30 - 11:30		Own case 12 – perform Monte Carlo simulation for estimating the overall variation
11:30 – 12:00		Exc. #4 – estimating the uncertainty in a prevalence study in a complex population using both prevalence data and expert opinion
Lunch break		
Wednesday afternoon – how to use different data sources in risk assessment / dose response models		

1:00 - 1:30	Data sources and how to define probability distributions from data	
1:30 – 3:00		Exercise 5: Frequently used probability distributions in food safety risk assessment
Coffee break		
3:00 – 4:00	How to judge quality of data?	
4:00 - 4:30	Dose – response modelling in food safety RA / animal health	
4:30-5:00		Exercise 3: Estimating likelihood of disease using dose response models
Thursday morning - model assumptions and influence on uncertainty and validity of the assessment		
8:30 - 9:00	Sensitivity analysis of a risk assessment model	
9:00 - 10:00		Own case 13: Sensitivity analysis using scenario analysis and more advanced analysis
Coffee break		
10:30-11:00	How to judge the validity of a risk assessment	
11:00 – 12:00		Own case 14: Outline measurable and un-measurable assumptions in your model
Lunch break		
Thursday afternoon – modelling variation and uncertainty simultaneously		
1:00 – 2:00		Own case 15: Apply MC
2:00 – 3:00	Including both uncertainty and variability in risk assessment	
3:00 – 5:00		Own case 16: Modelling both variability and uncertainty
Friday morning – finalizing case studies and poster presentations		
8.30 - 10:00	Participants working on their own case, incl. poster preparation	
Coffee break		
10:30 – 12:00	Participants working on their own case, incl. poster preparation	
Lunch break		
1:00 – 3:00	Presentations by students	
Closing session		
3:15 - 3:30	Communication of risk assessment results to stakeholders	
3:30 – 4:00	Risk assessment for AMR – we don't know what the consequence is / precautionary principles!	
4:00 – 5:00	Course wrap-up	