General information

Title: **Risk-based surveillance: design and analysis**

Motivation and objectives:

A risk-based approach to surveillance design is topical, economically desirable, and epidemiologically sound. Techniques for risk-based surveillance design and evaluation have been developed and are widely needed by surveillance analysts. Scenario-tree modelling is a tool that has been applied to the analysis of surveillance for demonstration of freedom from disease. This course expands this methodology and introduces new tools to allow the quantitative analysis of a number of different types of surveillance, including:

- Case-finding (when the objective of surveillance is to identify, for example, infected herds or infected individuals)
- Prevalence estimation
- Demonstration of freedom

This course aims to give participants

- an understanding of the principles of risk-based surveillance design and evaluation
- experience with techniques and tools for design and analysis of complex, non-random and risk-based sampling schemes within surveillance programs
- an understanding of the principles and practice of using varied, accumulated surveillance data to demonstrate freedom from disease
- skills required for quantitative analysis and evaluation of other types of surveillance (case finding and prevalence estimation)

Participants should have

- experience and interest in the principles of design and analysis of surveillance programs for livestock diseases;
- understanding of epidemiological principles, including sampling, laboratory test evaluation, basic probability theory and relative risk;
- laptop computers with MS Excel, ability to connect to a wireless network, and the administrator rights to install new software;
- expertise in use of MS Excel;
- basic understanding of stochastic modelling.

Workshop specifications

Pre- or post-conference? post-conference

Workshop size: minimum 15; maximum 30

Duration: 5 days

Specific needs: Two large white/black boards; projector and screen; internet access (at least for presenter)

Workshop contents

Workshop content will be based on presentation of concepts, interactive discussion, and reinforcement and application of concepts by practical exercises and case studies using *MS Excel* and *EpiTools*[1]. An overview of the program follows:

<table>
<tr><th>Day</th><th>Session</th><th>Material to be covered</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">1</td><td>Welcome, Introductions, etc</td></tr>
<tr><td rowspan="3">
Underpinning Theory

Surveillance – what is it and why do we do it?

Disease that are present
Diseases that are absent

Quantitative measures of the quality of surveillance

Disease absent

Freedom
Early detection

Disease present

Case finding
Prevalence estimation

Coverage and representativeness
test performance

sensitivity and specificity
predictive values
group/population level testing
dealing with small populations

sampling populations

simple random sampling
stratified sampling
multi-stage sampling

relative risk
design prevalence
disease freedom concepts

component/system sensitivity
confidence in freedom
perfect specificity
surveillance systems/components

</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>1</td><td>3</td><td rowspan="3">
Representative freedom surveys

1-stage simple survey
2-stage surveys
sample size calculations
varying sensitivity
accumulation of evidence over time

probability of introduction

design prevalence to meet desired performance
case studies in Excel and EpiTools

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<tr><td>1</td><td>4</td></tr>
<tr><td>2</td><td>1</td></tr>
</table>

[1] Sergeant, ESG, 2009. Epitools epidemiological calculators. Available at: http://epitools.ausvet.com.au

Day	Session	Material to be covered
2	2	**Risk-based freedom surveys** • principles of risk-based surveillance • risk-based stratification • incorporating multiple risk factors • 1-stage simple survey • 2-stage surveys • sample size calculations • traps and potential problems • case studies in Excel and EpiTools
2	3	
2	4	

3	1	**Complex Surveillance systems**
		• Surveillance system components
		  • Combining multiple components
		  • more complex data sets: using 'real-life' information
		  • analysing general surveillance
		  • clustering
		  • comparing SSCs
		• scenario trees for complex systems
		• independence
		  • of sequential observations
		  • of risk and grouping factors
		  • of SSCs
		• case studies in Excel and EpiTools

3	2	
3	3	
3	4	**Surveillance for case detection** • Context and examples of case-detection surveillance • Objectives of the analysis • Risk factors and bias in case-detection • What happened to the design prevalence? • Application of scenario trees • Practical examples of analysis • Spreadsheet exercises
4	1	
4	2	

4	3	**Surveillance for prevalence estimation**
		• Traditional approaches to prevalence estimation
		  • Survey design
		  • Representative sampling
		• Bias in surveillance
		• Scenario-trees for managing bias
		• What is the objective of the analysis?
		• Why use risk-based (biased) surveillance?
		• Spreadsheet exercises

4	4	
5	1	

5	2	**Surveillance design**
		• Converting an output-based standard into a plan
		• Sample sizes
		• Coverage of population
		• Time period
		  • Accumulation of evidence
		  • Probability of introduction
		• Cost minimisation

5	3	
5	4	
		Wrap-up and close

Registration fee: €800

History of this workshop

This is the first time this specific course has been given, although the presenters, both together and individually, have given courses with similar content on numerous occasions, starting at ISVEE 10 in 2003. Venues have included universities, government departments and institutes, on all continents except Antarctica. These courses have typically been well attended, and total participants number more than 500. A course has not been offered in association with ISVEE since 2003.

This course differs from previous similar courses in that there is less time spent on scenario trees and a number of new concepts are introduced, including sample size estimation for risk-based surveillance, application of risk-based methods to case detection and prevalence estimation, and principles of risk-based surveillance design.

Workshop organisers

Angus Cameron
Email: angus@ausvet.com.au
Angus has been a Director of AusVet Animal Health Services since 2000. With the other members of the training team, he was involved in pioneering research into the quantitative evaluation of complex surveillance resulting in the development of the scenario-tree methodologies. Angus works in surveillance, information systems, GIS and epidemiological data analysis across a range of species (terrestrial, aquatic and human) and environments (developed and developing countries). He has extensive training experience having conducted courses on five continents.

Evan Sergeant
Email: evan@ausvet.com.au
Evan is a Director of AusVet Animal Health Services and has worked as a senior consultant or Director for AusVet since 2001. In this role he has provided epidemiological input for a wide range of projects, including modelling, data analysis, risk analysis, disease surveillance and training. Evan has a particular interest in disease surveillance methodologies and has had an active involvement in development and application of analytical methods for risk-based surveillance. He also has extensive experience in providing training in epidemiological and surveillance methods.

Tony Martin
Email: peter.martin@agric.wa.gov.au
Tony is a veterinary epidemiologist with the Western Australian Department of Agriculture and Food. In recent years he has focussed on methodological development, practical application and training in the areas of risk assessment and evaluation of surveillance for disease detection. He has been closely involved in the development of methods and tools for analysis of risk-based surveillance data, and has led numerous training courses and workshops on evaluation of complex surveillance systems.