

On the use of capture-recapture methodologies for assessing quantitatively disease surveillance systems

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General information

Epidemiological surveillance systems are essential to detect emergences, to follow spatial and temporal distribution of diseases and ultimately for establishing relevant control strategies. However, surveillance systems generally suffer from underdetection issues. The extent to which such issues impair the information provided by surveillance systems is most often unknown. In this context it is essential to develop tools that allow quantitative evaluations of the efficiency of surveillance systems. Capture-recapture techniques are known to be one of the most adapted tools to reach this goal.

This course will allow the participants to acquire knowledge and skills on capture-recapture techniques and models. The statistical conceptual framework will also be presented. At the end of the course, participants should be able to identify what kind of data can be treated with capture-recapture techniques, to choose the more suitable approach given the structure of the data, to analyze the data and discuss the results.

This workshop is dedicated to anyone interested in surveillance of animal diseases. No specific knowledge on capture-recapture methodologies and models is needed. However, because the R software will be used for illustrations and practicals, we expect participants to have basic skills in the use of this statistical software.

Workshop specifications

We would prefer to organize this workshop as a pre-conference workshop.

Expected number of attendees: from 10 to 20.

This workshop is to last for 2 days

Specific needs: Laptop, specific free softwares such as R, Survey Toolbox, SPADE... More precisions will be given on due time.

Workshop contents

The workshop will alternate technical presentations, discussions of published applications, and practicals. Please find below the precise timetable.

DAY 1

- 8:30 – 9:00: *Registration*
- 9:00 – 10:30: General Introduction: CR methodology for estimating the sensitivity of detection
History of capture-recapture methods
Introduction to multilist capture-recapture data
Two-list capture-recapture method
- 10:30 – 11:00: *Coffee break*
- 11:00 – 12:30: Three-list capture-recapture method using log-linear modelling
- 12:30 – 13:30: *Lunch break*
- 13:30 – 15:00: PRACTICAL on two-list and three-list capture-recapture methods using real epidemiological data
- 15:00 – 15:30: *Coffee break*
- 15:30 – 17:00: Introduction to unilist capture-recapture data
Maximum likelihood estimations of population size using zero-truncated count models and zero-inflated count models under homogeneity

DAY 2

- 9:00 – 10:30: Introduction to heterogeneity
Dealing with heterogeneity 1: Use of non-parametric estimates (Zelterman, Chao)
Dealing with heterogeneity 2: Use of mixture models
Dealing with heterogeneity 3: Use of covariate information
- 10:30 – 11:00: *Coffee break*
- 11:00 – 12:30: PRACTICAL on unilist capture-recapture methods using real epidemiological data
- 12:30 – 13:30: *Lunch break*
- 13:30 – 15:00: Introduction to ecological capture-recapture applications that could be of interest for epidemiology
Multi-state capture-recapture models and applications in epidemiology
- 15:00 – 15:30: *Coffee break*
- 15:30 – 17:00: Site occupancy models and applications in epidemiology
General conclusion and perspectives

Registration fee

250 euros

History of the workshop:

- *Introduction to capture-recapture techniques for epidemiological surveillance.*
International Conference on Animal Health Surveillance (ICAHS), Lyon, France
May 6th 2011 (1 day)
18 participants
- *Introduction to capture-recapture methods applied to (animal) disease surveillance.*
Bangkok, Thailand
June 22nd – 24th 2011 (3 days)
21 participants

Workshop organizers:

Timothée Vergne is a veterinarian with a specific interest in modelling emerging diseases surveillance and control. He is performing his PhD since 2009 on the use of capture-recapture for estimating the sensitivity of disease surveillance systems.

Vladimir Grosbois is a researcher in biostatistics with a solid experience on the development and application of capture recapture models for investigations of animal population and epidemiological dynamics.

References

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- Grosbois V.**, Gimenez O., Gaillard J.M., Prader R., Barbraud C., Clobert J., Moller A.P., Weimerskirch H., (2008) Assessing the impact of climate variation on survival in vertebrate populations. *Biol. Rev.*, **83**: 357-399.
- Grosbois V.**, Tavecchia G., (2003) Modeling dispersal with capture-recapture data: disentangling decisions of leaving and settlement. *Ecology*, **84**: 1225-1236
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- Vergne T.**, Goutard F., Holl D., Bellet C., Roger F., Dufour B., **Grosbois V.**, A capture-recapture analysis in a challenging environment: assessing the epidemiological situation of foot-and-mouth disease in Cambodia. *Prev Vet Med* (in press)
- Vergne T.**, Paul M., Chaengprachak W., Durand B., Yatbantoong N., Dufour B., Roger F., **Grosbois V.**, Assessing the H5N1 surveillance system in Thailand using a zero-inflated modelling approach (in prep)