# SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

**This report is submitted for approval by the STSM applicant to the STSM coordinator**

**Action number: 17110**
**STSM title: Review on the use of decision-tree models for animal health surveillance purposes**
**STSM start and end date: 08/08/2021 to 28/08/2021**
**Grantee name: Gary Delalay**

---

**PURPOSE OF THE STSM:**

(max.200 words)
The purpose of the STSM was to develop the first steps of a scoping review about the use of scenario tree models to demonstrate freedom from animal disease as described by Martin et. al (2007). More exactly, the first steps were defined as the elaboration of a protocol with:
a) the definition of the databases to search and their particular search strings as well as alternative search strategies;
b) the rules of inclusion and exclusion for title and abstract as well as full text screening; and
c) a form for the data extraction.
It was also planned for the applicant to develop a list of papers and other material retrieved from the search strategies.

---

**DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS**

(max.500 words)
During the preparatory phase for the STSM before the actual STSM, monthly meetings were planned from automn 2020 onwards between Petter Hopp (the host), John Berezowski (leader of the working group 4), Luís Pedro Gomes do Carmo (co-leader of the working group (WG) 4) and me. Later on, Maria Guelbenzu (co-leader of the WG 4), Aurélien Madouasse (leader of the WG 3) and Eleftherios Meletis (co-leader of the WG 3) also joined the monthly meetings.

During these meetings, we discussed the project and its advancement. It allowed me to complete most of the protocol before the start of the STSM. The search strategies (among others the general outline of the search string and its specific declinations for each database) were the main topic which we discussed, until we were confident enough with our search strings to discuss it with a librarian to finalize it. This enabled us to begin the STSM with finalized search strings and a list of papers retrieved by the search. In parallel, we also wrote a mail to a mail list to call experts to send us material (with a focus on grey literature) which could be of interest for our study, which we added to our list of papers. We also defined our inclusion and exclusion criteria as well as a detailed flowchart for the whole process of the scoping review. Additionnaly, we also outlined a first draft of the form for the data extraction.

During the period allocated to the STSM, we started with a calibration exercise between the different partners to screen titles and abstracts. Then, I screened all titles and abstracts for the material we had retrieved, while the other participants (e.g. Petter, John, Luis, Maria, Aurélien and Eleftherios) split between themselves the papers and served as second reviewer.

In parallel, we developed further the form for data extraction. We aimed to retrieve general information about the methods and its application, but we also aimed to identify potential gaps of this method, which was of particular interest for the WG 4, and to target detailed information about the methods and data types used, which was of particular interest for the WG 3. I also have begun writing a first draft of some sections of the final chapter (introduction, material and methods) and have made suggestion about how to present results we could extract.
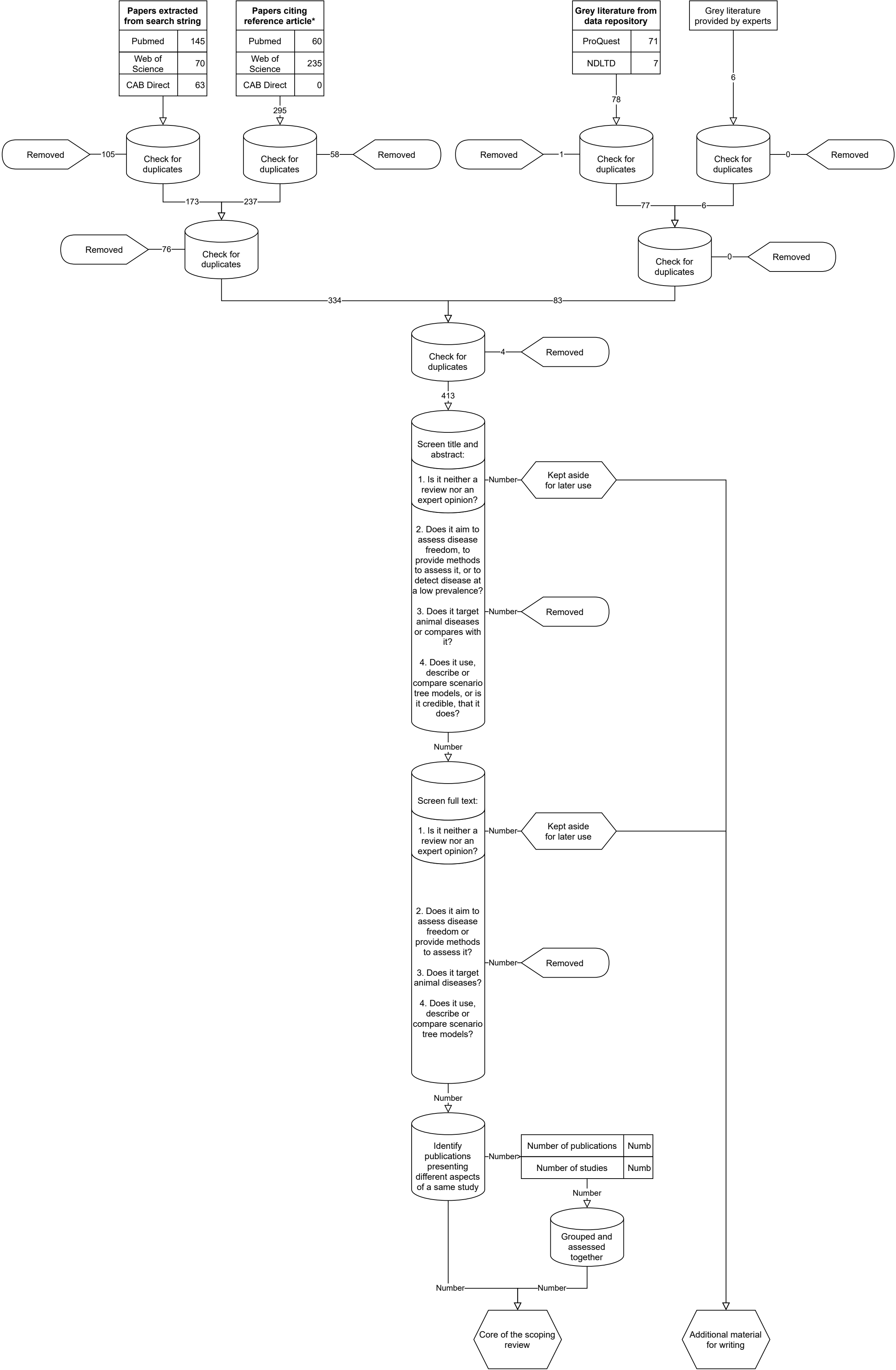
## DESCRIPTION OF THE MAIN RESULTS OBTAINED

At the end of the STSM, we now have:
a) a finalized protocol for the elaboration of the scoping review;
b) a list of material we could use for the scoping review which already underwent title and abstract screening from two reviewers (available in Covidence only);
c) a first version of the form we can use for the data extraction;
d) a draft of the flowchart of the whole process of the scoping review (the draft of the flowchart is filled for the steps up to abstract and title screening and remains to be filled for the following steps); and
e) a first draft of some sections of the final paper with suggestions of potential result presentation.
All the material (except the list of papers) can be found in the supplementary materials at the end of this document.

## FUTURE COLLABORATIONS (if applicable)

I will gladly further collaborate with the team to finish this scoping review. It is already planned that we will meet to resolve conflicts during the title and abstract screening by discussion and consensus between the reviewers involved. I would also happily be one of the collaborators splitting the papers to serve as second reviewer for the full text screening and would be glad to collaborate on the writing of the paper and the preparation of other material at the end of the review. I am also ready to participate with other tasks if this is needed.

# Appendix 1: Flow Diagram

| Papers extracted from search string | |
| --- | --- |
| Pubmed | 145 |
| Web of Science | 70 |
| CAB Direct | 63 |

| Papers citing reference article* | |
| --- | --- |
| Pubmed | 60 |
| Web of Science | 235 |
| CAB Direct | 0 |

| Grey literature from data repository | |
| --- | --- |
| ProQuest | 71 |
| NDLTD | 7 |

Grey literature provided by experts

Removed —105— Check for duplicates

Check for duplicates —58— Removed

295

Removed —1— Check for duplicates

Check for duplicates —0— Removed

78

6

173 —237—

77 —6—

Removed —76— Check for duplicates

Check for duplicates —0— Removed

334

83

Check for duplicates —4— Removed

413

Screen title and abstract:

1. Is it neither a review nor an expert opinion?
—Number— Kept aside for later use

2. Does it aim to assess disease freedom, to provide methods to assess it, or to detect disease at a low prevalence?

3. Does it target animal diseases or compares with it?
—Number— Removed

4. Does it use, describe or compare scenario tree models, or is it credible, that it does?

Number

Screen full text:

1. Is it neither a review nor an expert opinion?
—Number— Kept aside for later use

2. Does it aim to assess disease freedom or provide methods to assess it?

3. Does it target animal diseases?
—Number— Removed

4. Does it use, describe or compare scenario tree models?

Number

Identify publications presenting different aspects of a same study
—Number—

| Number of publications | Numb |
| --- | --- |
| Number of studies | Numb |

Number

Grouped and assessed together

Number

Number

Core of the scoping review

Additional material for writing

# Appendix 2: Protocol

# The use of scenario tree models to assess freedom from animal disease—protocol for a scoping review

## SOUND control COST action CA17110—Standardizing output-based surveillance to control non-regulated diseases of cattle in the EU

Gary Delalay[1], Luis Pedro Carmo[2], John Berezowski[3], Aurélien Madouasse[4], Eleftherios Meletis[5], Maria Guelbenzu[6], Petter Hopp[7*]

[1] Department of Animal Health, Federal Food Safety and Veterinary Office, Bern, Switzerland
[2] Veterinary Public Health Institute, Universität Bern, Bern, Switzerland
[3] SRUC Dept of Veterinary and Animal Sciences, Inverness, Scottland
[4] BIOEPAR, INRAE, Oniris, Nantes, Frankreich
[5] Faculty of Public and One (Integrated) Health, University of Thessaly, Mavromichali st., Karditsa, 43100, Greece
[6] Animal Health Ireland, Carrick-on-Shannon, Irland
[7] Section of Epidemiology, Norwegian Veterinary Institute, Ås, Norway

Petter Hopp
Section of Epidemiology, Norwegian Veterinary Institute
Pb 750 Sentrum, N-0106 Oslo
Norway

# Background

Assessing freedom from animal diseases is important for a country to be authorised to trade internationally animals and animal products. However, it is not possible to prove categorically freedom from disease, as even if all the susceptible individuals were to be tested, the test sensitivity would not achieve 100%. Therefore, partner countries usually ask to prove with a given confident interval that the prevalence of a certain disease lies below a defined threshold.

Martin et al. (2006) proposed a scenario tree methodology to combine different surveillance components together. This enables components to have different sensitivities, different risk factors or different detection methods, as a surveillance system is rarely built with a single, uniform component across the whole susceptible population. Switzerland for instance prefer the use of bulk tank milk serology compared to blood serology to detect IBR in cattle. This is indeed cheaper and easier to manage. However, this can only be done for herds with milking cattle; fattening cattle still has to be tested via blood sample. Compared to the classical method, the use of scenario tree models also enables the use of risk factor to weight the herds differently. Targeting high-risk herds allows then to reduce the sample size and to increase the level of confidence of the surveillance program.

However, despite the fact that scenario tree models are broadly used by federal offices to demonstrate freedom from disease, there is a lack of accepted standardisation for the performing of the analysis, the estimation of the parameters and the presentation of the results. Therefore, we plan to perform a scoping review which would aim to cover the field of use of scenario tree models to assess freedom from animal disease to identify 1) what the uses are, 2) how these studies are performed and reported, 3) what challenges and limitations they encountered and 4) to propose recommendations to improve the consistency and reporting of such studies. General information about this planned scoping review can be found in Table 1.

This protocol, which was designed by considering the PRISMA-P and PRISMA-ScR statements, aims to define the bases upon which the actual scoping review will be build.

# Objectives

We will conduct a systematic search of the published and grey literature for scenario tree models used to assess freedom from animal disease. The objectives of this scoping review are 1) to identify what scenario tree models are used for in the context of freedom from animal diseases; 2) to map out the characteristics and range of methodologies used in the identified studies; 3) to examine the reported challenges and limitations of the scenario tree approach; and 4) to propose recommendations for advancing the approach and enhancing the consistency with which assessment of disease freedom using the scenario tree approach are undertaken and reported.

# Search strategy

## Research question

We defined the search question by using the PICo framework, which applies to qualitative studiues (Table 2). From this framework we defined the research question as this: How are scenario tree models used for assess freedom from animal disease?

## Main topic and terms

Scenario tree models
>       Scenario tree
>       Risk based

Use
>   Will not be included in the search string but will be assessed by screening after the search is performed.

Animal disease freedom

>   Disease freedom component
>       Disease freedom
>       Freedom from

>   Animal disease component

>       Epizootic subcomponent
>           Epizootic

>       Veterinary subcomponent
>           Veterinary

>       Animal subcomponent

Animal
Pig / Swine / Porcine / Piglet / Weaner / Gilt / Sow / Boar / Finisher / Fattener
Cattle /Dairy / Cow / Calf / Calves / Heifer / Beef / Bull / Ruminant / Bovine / Ovine / Sheep Lamb / Ewe / Goat / Doe / Buck
Horse / Foal / Mare / Stallion / Gelding / Equid / Equine
Dog / Puppy / Bitch / Canine / Cat / Kitten / Feline
Bird / Avian / Poultry / Hen / Chicken / Broiler / Layer / Turkey / Goose / Geese / Duck / Quail
Fish / Shellfish / Crustacean / Shrimp / Prawn / Aquaculture
Reindeer / Deer
Rabbit / Bee

## Databases searched

Published literature will be retrieved from CAB Direct, Pubmed and Web of Science. Grey literature will be searched for in ProQuest (through library access, search in the categories "Conference Papers & Proceedings", "Government & Official Publications", "Reports", "Working Papers" and "Dissertations") and NDLTD. Finally, papers citing Martin et al. (2007) will be extracted from CAB Direct, Pubmed and Web of Science. Only publications published after 2006 will be considered.

## Search strategy

### General outline of the search string

1. Scenario tree models = Scenario tree OR Risk based

2. Disease freedom component = Disease freedom OR Freedom from

3. Epizootic subcomponent = Epizootic

4. Veterinary subcomponent = Veterinary

5. Animals = Animal

6. Pigs = Pig OR Swine OR Porcine OR Piglet OR Weaner OR (Gilt NOT (gamma-interferon-inducible lysosomal thiol reductase OR IFN-γ-inducible lysosomal thiol reductase)) OR Sow OR Boar OR Finisher OR Fattener

7. Domestic ruminants = Cattle OR Cow OR Dairy OR Calf OR Calves OR Heifer OR Beef OR Bull OR Ruminant OR Bovine OR Ovine OR Sheep OR Goat Lamb OR Ewe OR Goat OR Doe OR Buck

8. Horses = Horse OR Foal OR Mare OR Stallion OR Gelding OR Equid OR Equine

9. <u>Pet animals</u> = **Dog** OR **Canine** OR **Puppy** OR **Bitch** OR **Cat** OR **Feline** OR **Kitten**

10. <u>Birds</u> = **Bird** OR **Avian** OR **Poultry** OR **Hen** OR **Chicken** OR **Broiler** OR **Layer** OR **Turkey** OR **Goose** OR **Geese** OR **Duck** OR **Quail**

11. <u>Aquatic animals</u> = **Fish** OR **Shellfish** OR **Crustacean** OR **Shrimp** OR **Prawn** OR **Aquaculture**

12. <u>Other farmed animals</u> = **Rabbit** OR **Bee**

13. <u>Wild animals</u> = **Reindeer** OR **Deer**

14. <u>Animal subcomponent</u> = <u>#5 (Animals)</u> OR <u>#6 (Pigs)</u> OR <u>#7 (Domestic ruminants)</u> OR <u>#8 (Horses)</u> OR <u>#9 (Pet animals)</u> OR <u>#10 (Birds)</u> OR <u>#11 (Aquatic animals)</u> OR <u>#12 (Other farmed animals)</u> OR <u>#13 (Wild animals)</u>

15. <u>Animal disease component</u> = <u>#3 (Epizootic subcomponent)</u> OR <u>#4 (Veterinary subcomponent)</u> OR <u>#14 (Animal subcomponent)</u>

16. <u>Animal disease freedom</u> = <u>#2 (Disease freedom component)</u> AND <u>#15 (Animal disease component)</u>

17. <u>Search string</u> = <u>#1 (Scenario tree models)</u> AND <u>#16 (Animal disease freedom)</u>

This forms the outline of the general search string. A specialized search string was then adapted from this general string for each database. Detailed information about these search strings can be found in the supplementary materials.

<u>Other search strategies</u>

Papers citing the publication of Martin et al. (2006) will be included to the results.

Besides the search in grey literature databases, grey literature will also be searched for by making a request to the epimail list as well as to several contacts working at federal offices.

# Methods of the review

A summary of the methods can be found in Table 3.

## Data management and screening

The publications retrieved will be uploaded onto covidence and checked for duplicates. Two reviewers will then screen the title and abstract, G. Delalay serving as first reviewer and the other

collaborators splitting the papers between themselves to serve as second reviewer. Conflicts will be resolved by discussion and consensus between the reviewers. If no consensus can be reached, the article will be included to the full text screening. The full text screening will also be performed by two reviewers, X. XXXX serving as first reviewer and the other collaborators as second reviewer. Conflicts will be resolved by discussion and consensus. When no consensus can be reached, a third reviewer will decide.

To avoid conflicts of interest, articles written by an author of this review or a member of his team will not be screened by the reviewer linked to it but by another independent reviewer.

## Eligibility criteria

The studies considered will be all studies corresponding to the following criteria: 1) the study is neither a review nor an expert opinion, 2) the study aims to assess disease freedom or provides methods to assess it, 3) the study target animal diseases, and 4) the study uses or describes the use of scenario tree models or compares its use with the use of other methods (Figure 1). Additionally, the studies should be written in English, French, German, Norwegian, Portuguese or Spanish, although publications in other languages will not be discarded based only on their language.

Also, as a same study can be covered by several documents (for instance besides peer reviewed publications also internal documentation or other grey literature format), diverse documents from a same study will be grouped together during the full text screening (Figure 1).

Studies that do not meet all four of the criteria defined above will be excluded. Opinion papers or reviews will be kept aside to check if all relevant cited articles are included in the review.

## Data extraction

Two reviewers will extract the data according to the attached form (Table 4). Similarly to the screening, data from articles written by an author of this review or a member of his team will not be extracted by the reviewer linked to it but by another independent reviewer to avoid conflict of interest.

Prior to the actual extraction, the extraction form will undergo testing and refinement.

# Presentation of results

The results of this scoping review will be published in an international journal. Additionally, the results will be presented at a meeting of the SOUND control and a report will be made for the SOUND control. The results will also be presented at an international conference.

When presenting the results of this scoping review, the search and screening processes will be presented with a flowchart (Figure 1). The published protocol will be cited and the amendments done to it will be documented for the scientific publication while the protocol will be detailed in his entirety for the report and the presentation to the SOUND control. The characteristics of the selected studies and of their results will be presented in tables.

The results will be presented according to the PRISMA-ScR statement.

Table 4 summarizes how the results of the scoping review will be presented.

# Contributions

We will have to define who will do what. I propose something like: GD and/or another young scientist (YS) chosen for a STSM fund will do the screening of abstracts and full text and the data extraction. PH, JB and LPC will deal with the cases for which GD or YS is not sure and with the cases where GD or YS could potentially have conflicts of interest. GD and/or YS, PH, JB and LPC will be involved with the evaluation of the selected papers and the writing of the review.

# Tables

## Table 1

General information about the scoping review

Table 1: General information about the scoping review

| Title of the review | The use of scenario tree models to assess freedom from animal disease — a scoping review |
|---|---|
| First reviewer | **Gary Delalay**, Federal Food Safety and Veterinary Office, Bern, Switzerland, gary.delalay@blv.admin.ch |
| Second reviewer | One of the supervisor ar of the other scientific advisors |
| Supervisor | **Petter Hopp**, Section of Epidemiology, Norwegian Veterinary Institute, Oslo, Norway, petter.hopp@vetinst.no |
| Other scientific advisors | **John Berezowski**, Veterinary Public Health Institute, University of Bern, Bern, Switzerland, john.berezowski@vetsuisse.unibe.ch<br>**Luís Pedro Carmo**, Veterinary Public Health, University of Bern, Bern, Switzerland, luis.gomesdocarmo@vetsuisse.unibe.ch<br>**Maria Guelbenzu**, Animal Health Ireland, Carrick-on-Shannon, Ireland, mguelbenzu@animalhealthireland.ie<br>**Aurélien Madouasse**, BIOEPAR, INRAE, Oniris, Nantes, France, aurelien.madouasse@oniris-nantes.fr<br>**Eleftherios Meletis**, Faculty of Public and One (Integrated) Health, University of Thessaly, Mavromichali st., Karditsa, 43100, Greece, emeletis@outlook.com |
| Funding | SOUND control COST action CA17110—Standardizing output-based surveillance to control non-regulated diseases of cattle in the EU |
| Conflicts of Interest | None. However, as the authors and their respective teams already worked or still work with scenario tree models, some included papers could be written by the authors or members of their respective teams. The funder did not take part in the development of the protocol. |

## Table 2

PICo framework

Table 2: PICo framework

| P | Problem | Scenario tree models |
|---|---|---|
| I | Interest | Use |
| Co | Context | Freedom from animal disease |

# Table 3

Summary of the methods

Table 3: Summary of the methods

| Software used | Covidence will be used to manage and screen the publications. |
|---|---|
| Details of method | One main reviewer and a two other reviewers for unclear cases. Decision for unclear cases achieved by consensus. |
| Title and abstract screening | Two reviewers. Decision for conflicts solved by discussion and consensus. If no consensus achieved, will be included to the full text review. |
| Full-text screening | Two reviewers. Decision for conflicts solved by discussion and consensus. If no consensus achieved, a third reviewer will be involved to take the decision. |
| Quality assessment | None |
| Data extraction | The data extraction will be made by two reviewers. Details for the data to extract can be found in table 5. |

## Table 4

Summary of the presentation of the results of the scoping review

Table 4: Summary of the presentation of the results of the scoping review

| | |
|---|---|
| Presentation of the materials | Flow chart of the whole process<br>Protocol<br>Data extraction tables |
| Outputs from review | Report to the SOUND control<br>Presentation at a SOUND control meeting<br>Publication in an international journal<br>Presentation at an international conference |

## Table 5

Extraction form

See excel document

# Supplementary material

## Supplementary figure 1

Flowchart of the scoping review
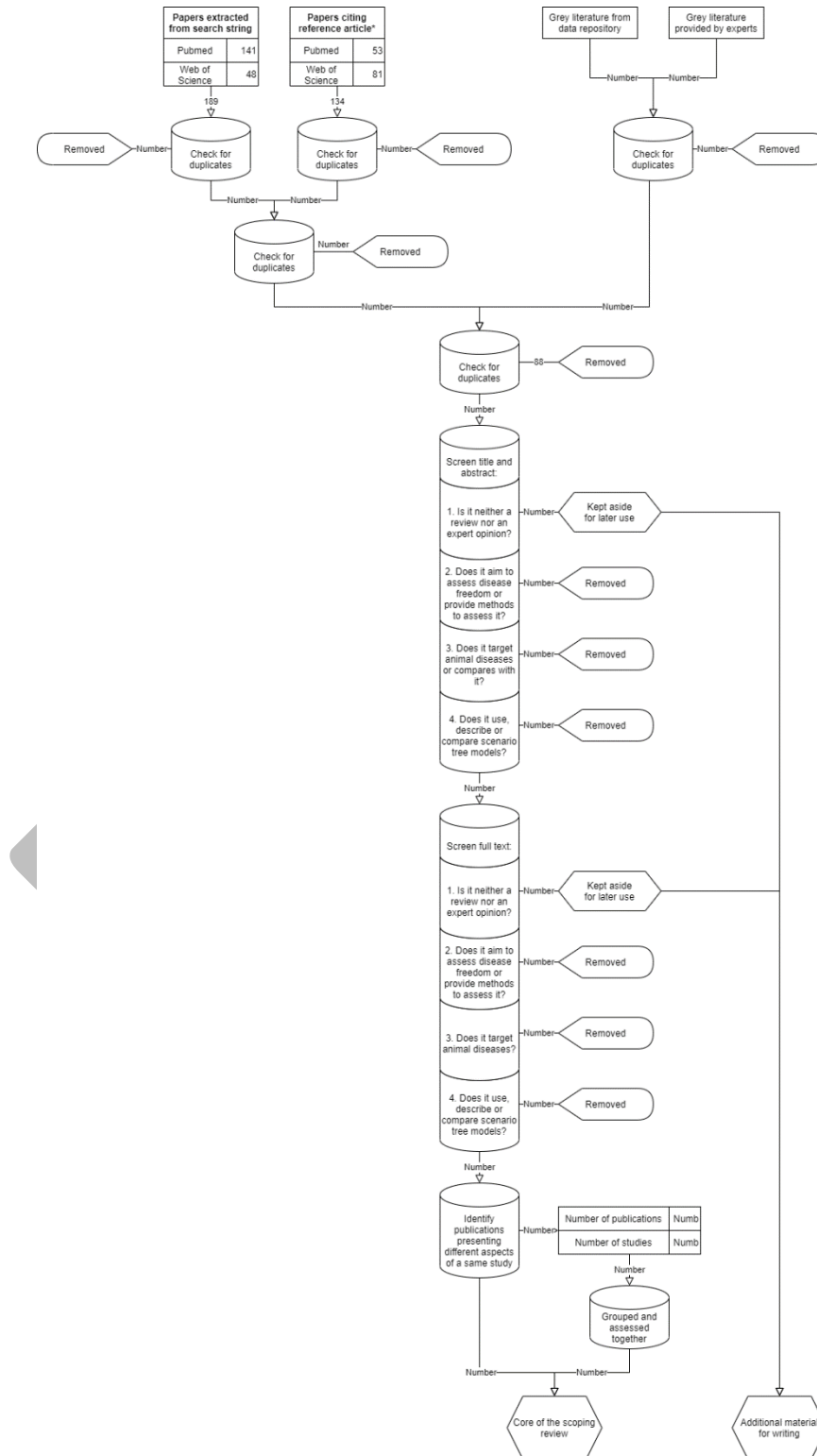


Figure 1:Flowchart of the scoping review

## Search string for Pubmed

<u>Search string</u>

(Scenario tree[tiab] OR Scenario trees[tiab] OR Risk based[tiab] OR Decision tree[Mesh])
AND

(Population Surveillance[Mesh] OR Sentinel Surveillance[Mesh] OR Disease* n3 freedom[tiab] OR Freedom from[tiab])
AND

( ( (Veterinary[tiab] OR Veterinary[MeSH Subheading] OR Veterinary[sb] OR Animal*[tiab] OR Epizootic*[tiab] OR Animal Diseases[Mesh])

OR (Animal Population Groups[Mesh] OR Invertebrates[Mesh] OR Chordata, Nonvertebrate[Mesh] OR Amphibians[Mesh] OR Birds[Mesh] OR Fishes[Mesh] OR Reptiles[Mesh] OR Marsupialia [Mesh] OR Monotremata[Mesh] OR Proboscidea Mammal[Mesh] OR Artiodactyla[Mesh] OR Carnivora[Mesh] OR Cetacea[Mesh] OR Chiroptera[Mesh] OR Cingulata[Mesh] OR Hyraxes[Mesh] OR Insectivora[Mesh] OR Lagomorpha[Mesh] OR Perissodactyla[Mesh] OR Rodentia[Mesh] OR Scandentia[Mesh] OR Sirenia[Mesh] OR Strepsirhini[Mesh] OR Platyrrhini[Mesh] OR Tarsii[Mesh] OR Cercopithecidae[Mesh] OR Hylobatidae[Mesh] OR Gorilla gorilla[Mesh] OR Pan paniscus[Mesh] OR Pan troglodytes[Mesh] OR Pongo[Mesh])

OR

(Pig[tiab] OR Pigs[tiab] OR Swine*[tiab] OR Porcine[tiab] OR Piglet*[tiab] OR Weaner*[tiab] OR (Gilt*[tiab] NOT (gamma-interferon-inducible lysosomal thiol reductase[tiab] OR IFN-γ-inducible lysosomal thiol reductase[tiab])) OR Sow[tiab] OR Sows[tiab] OR Boar[tiab] OR Boars[tiab] OR Finisher*[tiab] OR Fattener*[tiab])

OR

(Cattle[tiab] OR Cow[tiab] OR Cows[tiab] OR Dairy[tiab] OR Dairies[tiab] OR Calf[tiab] OR Calves[tiab] OR Heifer*[tiab] OR Beef[tiab] OR Beefs[tiab] OR Beeves[tiab] OR Bull[tiab] OR Bulls[tiab] OR Ruminant*[tiab] OR Bovine[tiab] OR Bovid*[tiab] OR Ovine[tiab] OR Sheep[tiab] OR Sheeps[tiab] OR Lamb[tiab] OR Lambs[tiab] OR Ewe[tiab] OR Ewes[tiab] OR Goat[tiab] OR Goats[tiab] OR Doe[tiab] OR Does[tiab] OR Buck[tiab] OR Bucks[tiab])

OR

(Horse[tiab] OR Horses[tiab] OR Foal*[tiab] OR Mare[tiab] OR Mares[tiab] OR Stallion*[tiab] OR Gelding*[tiab] OR Equid[tiab] OR Equids[tiab] OR Equidae[tiab] OR Equine[tiab] OR Warmblood*[tiab] OR Warm blood*[tiab] OR cold blood*[tiab] OR hot blood*[tiab])

OR

(Dog[tiab] OR Dogs[tiab] OR Canine[tiab] OR Puppy[tiab] OR Puppies[tiab] OR Bitch[tiab] OR Bitches[tiab] OR Canid*[tiab] OR Cat[tiab] OR Cats[tiab] OR Feline[tiab] OR Kitten*[tiab] OR Felid*[tiab])

OR

(Bird[tiab] OR Birds[tiab] OR Avian*[tiab] OR Poultry[tiab] OR Poultries[tiab] OR Hen[tiab] OR Hens[tiab] OR Chicken*[tiab] OR Broiler*[tiab] OR Layer*[tiab] OR Turkey*[tiab] OR Goose[tiab] OR Geese[tiab] OR Duck[tiab] OR Ducks[tiab] OR Quail[tiab] OR Quails[tiab])

OR

(Fish[tiab] OR Fishes[tiab] OR Shellfish*[tiab] OR Crustacea*[tiab] OR Shrimp[tiab] OR Shrimps[tiab] OR Prawn[tiab] OR Prawns[tiab] OR Aquaculture*[tiab])

OR

(Rabbit[tiab] OR Rabbits[tiab] OR Leporid*[tiab] OR Bee[tiab] OR Bees[tiab])

OR

(Reindeer*[tiab] OR Deer[tiab] OR Deers[tiab] OR Cervid*[tiab])

)

)

Explanations

*Scenario tree models*

Decision tree[Mesh] added, as this Mesh term is used by several publications concerning scenario tree modelling (such as Martin et al. (2006)).

*Disease freedom component*

Population Surveillance[Mesh] and Sentinel Surveillance[Mesh] added, as these Mesh terms are used in several publications concerning freedom from disease.

*Animal panel*

The Mesh term Animals[Mesh] could not be used as is, as this Mesh term enclosed all animals, humans included. To work around this problem, all subcategories of Animals[Mesh] had to be separately included, each time replacing the Mesh division including humans by the Mesh subdivisions below. The result, although verbose (see search string from (Animal Population Group[Mesh] to Pongo[Mesh])), contains all the mesh terms related to animals but does not search for publications containing Humans[Mesh]. The advantage of this method when compared to the shorter Animals[Mesh] NOT Humans[Mesh] resides in the fact that publications tagged both with

a Mesh term inherent to an animal species (such as Cattle[Mesh]) and the Humans[Mesh] Mesh-term will still be searched for, and not directly excluded.

The Veterinary[sb] term is a PubMed filter for veterinary science (https://www.nlm.nih.gov/services/queries/veterinarymed_details.html).

## Search string for Web of Science

<u>Search string</u>

TS=(Decision-tree$ OR Scenario-tree$ OR Risk-based)

AND

TS=((Disease$ NEAR/3 freedom) OR Freedom-from)

AND

( ( WC=(Veterinary Sciences) OR SU=(Veterinary Sciences) OR TS=(Animal$ OR Epizootic$ OR Veterinary)

OR

TS=(Pig$ OR Swine$ OR Porcine OR Piglet$ OR Weaner$ OR (Gilt$ NOT (gamma-interferon-inducible lysosomal thiol reductase OR IFN-γ-inducible lysosomal thiol reductase)) OR Sow$ OR Boar$ OR Finisher$ OR Fattener$)

OR

TS= (Cattle OR Cow$ OR Dairy OR Dairies OR Calf OR Calves OR Heifer$ OR Beef$ OR Beeves OR Bull$ OR Ruminant$ OR Bovine OR Bovid$ OR Bovidae OR Ovine OR Sheep$ OR Lamb$ OR Ewe$ OR Goat$ OR Doe$ OR Buck$)

OR

TS= (Horse$ OR Foal$ OR Mare$ OR Stallion$ OR Gelding$ OR Equid$ OR Equine OR Warmblood$ OR Warm-blood$ OR cold-blood$ OR hot-blood$ OR Equid$ OR Equidae)

OR

TS= (Dog$ OR Canine OR Puppy OR Puppies OR Bitch OR Bitches OR Canidae OR Canid$ OR Cat$ OR Feline OR Kitten$ OR Felidae OR Felid$)

OR

TS= (Bird$ OR Avian$ OR Poultry OR Poultries OR Hen$ OR Chicken$ OR Broiler$ OR Layer$ OR Turkey$ OR Goose OR Geese OR Duck$ OR Quail$)

OR

TS= (Fish OR Fishes OR Shellfish* OR Crustacean$ OR Shrimp$ OR Prawn$ OR Aquaculture$ OR Crustacea$)

OR

TS= (Rabbit$ OR Leporid$ OR Leporidae OR Bee$)

OR

TS= (Reindeer$ OR Deer$ OR Cervid$ OR Cervidae)

)

)

<u>Explanations</u>

This search string includes `Decision-tree$` in the Scenario tree models component. This was decided to include more results and retrieve papers about scenario tree models which were added the `Decision tree` KeyWords Plus.

## Search string for CAB Direct

<u>Search string</u>

("Scenario tree" OR "Scenario trees" OR "Scenario-tree" OR "Scenario-trees" OR "Risk based" OR "Risk-based")

AND

("Disease freedom" OR "Disease-freedom" OR "Freedom from" OR "Freedom from")

AND

(      (      cc:LL000 OR cc:MM000 OR cc:YY700 OR cc:YY800 OR cc:EE117 OR Animal* OR Epizootic* OR Veterinary OR od:animals OR up:animals OR de:"veterinary science" OR de:"animal diseases"

OR

(Pig OR Pigs OR Swine* OR Porcine OR Piglet* OR Weaner* OR (Gilt* NOT (gamma-interferon-inducible lysosomal thiol reductase OR IFN-γ-inducible lysosomal thiol reductase)) OR Sow OR Sows OR Boar OR Boars OR Finisher* OR Fattener*)

OR

(Cattle OR Cow OR Cows OR Dairy OR Dairies OR Calf OR Calves OR Heifer* OR Beef OR Beefs OR Beeves OR Bull OR Bulls OR Ruminant* OR Bovine OR Bovid* OR Ovine OR Sheep OR Sheeps OR Lamb OR Lambs OR Ewe OR Ewes OR Goat OR Goats OR Doe OR Does OR Buck OR Bucks)

OR

(Horse OR Horses OR Foal* OR Mare OR Mares OR Stallion* OR Gelding* OR Equid OR Equids OR Equidae OR Equine OR Warmblood* OR "Warm blood*" OR "cold blood*" OR "hot blood*")

OR

(Dog OR Dogs OR Canine OR Puppy OR Puppies OR Bitch OR Bitches OR Canid* OR Cat OR Cats OR Feline OR Kitten* OR Felid*)

OR

(Bird OR Birds OR Avian* OR Poultry OR Poultries OR Hen OR Hens OR Chicken* OR Broiler* OR Layer* OR Turkey* OR Goose OR Geese OR Duck OR Ducks OR Quail OR Quails)

OR

(Fish OR Fishes OR Shellfish* OR Crustacea* OR Shrimp OR Shrimps OR Prawn OR Prawns OR Aquaculture*)

OR

(Rabbit OR Rabbits OR Bee OR Bees OR Leporid*)

OR

(Reindeer* OR Deer OR Deers OR Cervid*)

)

)

<u>Explanations</u>

This search is a simple implementation of the general search string. Cabicodes (`cc:XX####`) and descriptors (`up:, od: and de:`) were added to the third part of the search string to search publications with any relation to animal or veterinary subjects.

## ProQuest

("Scenario tree" OR "Scenario-tree" OR "Risk based" OR "Risk-based")

AND

((Disease NEAR/3 freedom) OR "Freedom from disease")

AND

(       (       (Veterinary OR Animal[*1] OR Epizootic[*1])

OR

(Pig[*1] OR Swine[*1] OR Porcine OR Piglet[*1] OR Weaner[*1] OR (Gilt[*1]

NOT (gamma-interferon-inducible lysosomal thiol reductase OR IFN-γ-inducible lysosomal

thiol reductase)) OR Sow[*1] OR Boar[*1] OR Finisher[*1] OR Fattener[*1])

OR

(Cattle OR Cow[*1] OR Dairy OR Dairies OR Calf OR Calves OR Heifer[*1] OR

Beef[*1] OR Beeves OR Bull[*1] OR Ruminant[*1] OR Bovine OR Bovid[*2] OR Ovine OR

Sheep[*1] OR Lamb[*1] OR Ewe[*1] OR Goat[*1] OR Doe[*1] OR Buck[*1])

OR

(Horse[*1] OR Foal[*1] OR Mare[*1] OR Stallion[*1] OR Gelding[*1] OR

Equid[*2] OR Equine OR Warmblood[*1] OR "cold blood[*1]" OR "hot blood[*1]")

OR

(Dog[*1] OR Canine OR Puppy OR Puppies OR Bitch OR Bitches OR Canid[*2]

OR Cat[*1] OR Feline OR Kitten[*1] OR Felid[*2])

OR

(Bird[*1] OR Avian[*1] OR Poultry OR Poultries OR Hen[*1] OR Chicken[*1]

OR Broiler[*1] OR Layer[*1] OR Turkey[*1] OR Goose OR Geese OR Duck[*1] OR Quail[*1])

OR

(Fish[*2] OR Shellfish[*2] OR Crustacea[*2] OR Shrimp[*1] OR Prawn[*1] OR

Aquaculture[*1])

OR

(Rabbit[*1] OR Bee[*1] OR Leporid[*2])

OR

(Reindeer[*1] OR Deer[*1] OR Cervid[*2])

)

)

(arbre[*1] NEAR/2 décision* OR schéma[*1] NEAR/2 décision* OR arbre[*1] NEAR/2

scénari[*2] OR "basé[*2] sur le risque" OR  "fondé[*2] sur le risque")

AND

(absence NEAR/3 maladie[*1] OR absence NEAR/3 épizootie[*1] OR absence  NEAR/3 infection[*1] OR libre[*1] NEAR/3 épizootie[*1] OR libre[*1] NEAR/3 maladie[*1] OR libre[*1] NEAR/3 infection[*1])

AND

( ( (vétérinaire[*1] OR épizootie[*1] OR animal OR animaux)

OR

(cochon[*1] OR porc[*1] OR porcin* OR truie[*1] OR porcelet[*1] OR sanglier[*1] OR laie[*1] OR marcassin[*1])

OR

(bétail OR vache[*1] OR boeuf[*1] OR bœuf[*1] OR bovin* OR bovidé[*1] OR génisse[*1] OR veau[*1] OR taureau[*1] OR ovin* OR caprin* OR mouton[*1] OR bélier[*1] OR brebis OR agneau[*1] OR chèvre[*1] OR bouc[*1] OR chevreau[*1]  OR ruminant[*1])

OR

(cheval OR chevaux OR étalon[*1] OR hongre[*1] OR jument[*1] OR poulinière[*1] OR poulain[*1] OR pouliche[*1] OR "pur sang[*1]" OR "demi sang[*1]" OR "sang chaud" OR"sang froid" OR équin* OR équidé[*1])

OR

(chien* OR chiot[*1] OR canin* OR canidé[*1] OR chat* OR chaton[*1] OR félin* OR félidé[*1])

OR

(oiseau[*1] OR aviaire[*1] OR ornitho* OR volaille[*1] OR poule[*1] OR poussin[*1] OR dinde[*1])

OR

(poisson[*1] OR crustacé[*1] OR mollusque[*1] OR crevette[*1])

OR

(cerf[*1] OR biche[*1] OR chevreuil[*1] OR cervidé[*1])

OR

(abeille[*1] OR lapin* OR lagomorphe[*1] OR léporidé[*1])

)

)

<u>Search string Deutsch</u>

(Entscheidungsb?um[*2] OR Entscheidungsdiagramm[*2] OR Szenariob?um[*2] OR "Szenario-Baum[*2]" OR "Szenario-Bäume[*1]" OR "Szenario-Bäumen" OR risikobasiert[*2])

AND

(Seuchenfreiheit)

AND

( ( (Veterinär* OR Tierseuche[*1] OR tierärztlich* OR Tier[*2])

OR

(Schwein[*2] OR Eber[*2] OR Sau[*2] OR Ferkel[*1] OR Wildschwein[*2] OR Willdeber[*2] OR Willdsau[*2] OR Wildferkel[*1]  OR Borstenvieh[*2] OR porzin*)

OR

(Rind OR Rinds OR Rindes OR Rinder[*1] OR Stier[*2] OR Bulle[*1] OR Ochse[*1] OR Muchse[*1] OR Jungstier[*2] OR Jungbulle[*1] OR Kuh OR Kühe[*1] OR Mutterkuh OR Mutterkühe[*1] OR Milchkuh OR Milchkühe[*1] OR Ammenkuh OR Ammenkühe[*1] OR Färse[*1] OR Kalb[*2] OR Kälber[*1] OR Jungvieh[*2] OR Milchvieh[*2] OR Galtvieh[*2]  OR Wiederkäuer[*1] OR Bovidae OR Nutztier[*2] OR Schaf[*2] OR Ziege[*1] OR ovin* OR bovin* OR caprin*)

OR

(Pferd[*2] OR Hengst[*2] OR Wallach[*2] OR Stute[*1] OR Fohlen OR Vollbl?t[*3] OR Halbbl?t[*3] OR Kaltbl?t[*3] OR equin* OR equidae)

OR

(Hund[*2] OR Rüde[*1] OR Hündin[*3] OR Welpe[*1] OR kanin* OR canidae OR Katze[*1] OR Kater[*1] OR Kätzin[*3] OR felin* OR felidae)

OR

(V?gel[*1] OR Geflügel OR Huhn OR Hühner[*1] OR Legehenne[*1] OR Truth?hn[*2] OR Truthenne[*1] OR Pute[*1] OR ornitho*)

OR

(Fisch[*2] OR Schalentier[*2] OR Krustentier[*2] OR Garnele[*1] OR Aquakultur OR crustacea[*1])

OR

(Hirsch[*2] OR Damhirsch[*2] OR Rothirsch[*2] OR Hirschk?h[*2] OR Hirschk?lb[*3] OR Reh[*2] OR Elch[*2] OR Ren[*1] OR Rene[*1] OR Rentier[*2] OR Cervidae)

OR

(Biene[*1] OR Kaninchen[*1] OR Hase OR Hasen OR Leporidae)
)
)

Explanations

This string is very similar to the general one. Additionally each step was also translated to French, German, OTHER LANGUAGES. The translation did not include all different technical names given to individuals of a same species based upon use or age (i.e. only "swine" was translated, and not "piglet", "weaner", "fattener", etc.). Sometimes truncation (*, [*1], [*2]) was used when it was believed that several endings were possible for the same word due to different possible grammatical agreements (for instance "épizootie" (French for epizootic, singular form) and "epizooties" (plural form)). Similarly, wildcard (?) was used when two different letters could be placed at the same position in the word (for instance "Vogel" (bird in German, singular form) and "Vögel" (plural form)). When the use of truncation or wildcard would be expected to allow other

non-relevant terms beside the ones we aimed to search for, we spelled all the different spellings of the searched terms linked by the Boolean operator OR instead of using truncation or wildcard (for instance "Rind" (cattle in German) can be grammatically spelled "Rind", "Rinds", "Rindes", "Rinder" or "Rindern" depending of the singular or plural form and the grammatical case, but "Rind*" would also search for "Rind**e**", which means tree bark in english).

# Search string for NDLTD

<u>Search string English</u>

("Scenario tree" OR "Scenario-tree" OR "Risk based" OR "Risk-based")

AND

("Disease freedom" OR "Freedom from")

AND

( ( (Veterinary OR Animal OR Animals OR Epizootic OR Epizootics)

OR

(Pig OR Pigs OR Swine OR Swines OR Porcine OR Piglet OR Piglets OR Weaner OR Weaners OR ((Gilt OR Gilts) NOT (gamma-interferon-inducible lysosomal thiol reductase OR IFN-γ-inducible lysosomal thiol reductase)) OR Sow OR Sows OR Boar OR Boars OR Finisher OR Finishers OR Fattener OR Fatteners)

OR

(Cattle OR Cow OR Cows OR Dairy OR Dairies OR Calf OR Calves OR Heifer OR Heifers OR Beef OR Beefs OR Beeves OR Bull OR Bulls OR Ruminant OR Ruminants OR Ruminantia OR Bovine OR Bovid OR Bovids OR Bovidae OR Ovine OR Sheep OR Sheeps OR Lamb OR Lambs OR Ewe OR Ewes OR Goat OR Goats OR Doe OR Does OR Buck OR Bucks)

OR

(Horse OR Horses OR Foal OR Foals OR Mare OR Mares OR Stallion OR Stallions OR Gelding OR Geldings OR Equid OR Equids OR Equidae OR Equine OR Warmblood OR Warmbloods OR "cold blood" OR "cold bloods" OR "hot blood" OR "hot bloods")

OR

(Dog OR Dogs OR Canine OR Puppy OR Puppies OR Bitch OR Bitches OR Canid OR Canids OR Canidae OR Cat OR Cats OR Feline OR Kitten OR Kittens OR Felid OR Felids OR Felidae)

OR

(Bird OR Birds OR Avian OR Avians OR Poultry OR Poultries OR Hen OR Hens OR Chicken OR Chickens OR Broiler OR Broilers OR Layer OR Layers OR Turkey OR Turkeys OR Goose OR Geese OR Duck OR Ducks OR Quail OR Quails)

OR

(Fish OR Fishes OR Shellfish OR Shellfishes OR Crustacea OR Crustaceae OR Crustacean OR Crustaceans OR Shrimp OR Shrimps OR Prawn OR Prawns OR Aquaculture OR Aquacultures)

OR

(Rabbit OR Rabbits OR Bee OR Bees OR Leporid OR Leporids OR Leporidae)

OR

(Reindeer OR Reindeers OR Deer OR Deers OR Cervid OR Cervids OR Cervidae)

)

)

("arbre de décision" OR "arbres de décision" OR "arbre décisionnel" OR "arbres décisionnels" OR "schéma de décision" OR "schémas de décision" OR "schéma décisionnel" OR "schémas décisionnels" OR "arbre de scénario" OR "arbres de scénario" OR "basé sur le risque" OR "basés sur le risque" OR "basée sur le risque" OR "basées sur le risque" OR "fondé sur le risque" OR "fondés sur le risque" OR "fondée sur le risque" OR "fondées sur le risque")

AND

("absence de la maladie" OR "absence de maladie" OR "absence de maladies" OR "absence d'épizootie" OR "absence d'épizooties" OR "absence de l'épizootie" OR "absence d'infection" OR "absence d'infections" OR "absence de l'infection" OR "libre de l'épizootie" OR "libre d'épizootie" OR "libre d'épizooties" OR "libre de la maladie" OR "libre de maladie" OR "libre de maladies" OR "libre de l'infection" OR "libre d'infection" OR "libre d'infections")

AND

( ( (vétérinaire OR vétérinaires OR épizootie OR épizooties OR animal OR animaux)

OR

(cochon OR cochons OR porc OR porcs OR porcin OR porcins OR porcine OR porcines OR truie OR truies OR porcelet OR porcelets OR sanglier OR sangliers OR laie OR laies OR marcassin OR marcassins)

OR

(bétail OR vache OR vaches OR boeuf OR boeufs OR bœuf OR bœufs OR bovin OR bovins OR bovine OR bovines OR bovidé OR bovidés OR génisse OR génisses OR veau OR veaux OR taureau OR taureaux OR ovin OR ovins OR ovine OR ovines OR caprin OR caprins OR caprine OR caprines OR mouton OR moutons OR bélier OR béliers OR brebis OR agneau OR agneaux OR chèvre OR chèvres OR bouc OR boucs OR chevreau OR chevreaux OR ruminant OR ruminants)

OR

(cheval OR chevaux OR étalon OR étalons OR hongre OR hongres OR jument OR juments OR poulinière OR poulinières OR poulain OR poulains OR pouliche OR pouliches OR "pur sang" OR "purs sangs" OR "demi sang" OR "demi sangs" OR "sang chaud" OR "sang froid" OR équin OR équins OR équine OR équines OR équidé OR équidés)

OR

(chien OR chiens OR chienne OR chiennes OR chiot OR chiots OR canin OR canins OR canine OR canines OR canidé OR canidés OR chat OR chats OR chatte OR chattes OR chaton OR chatons OR félin OR félins OR féline OR félines OR félidé OR félidés)

OR

(oiseau OR oiseaux OR aviaire OR aviaires OR ornithologique OR ornithologiques OR ornithologie OR ornithologue OR ornithologues OR ornithologiste OR

ornithologistes OR volaille OR volailles OR poule OR poules OR poulet OR poulets OR poussin OR poussins OR dinde OR dindes)

OR

(poisson OR poissons OR crustacé OR crustacés OR mollusque OR mollusques OR crevette OR crevettes)

OR

(cerf OR cerfs OR biche OR biches OR chevreuil OR chevreuils OR cervidé OR cervidés)

OR

(abeille OR abeilles OR lapin OR lapins OR lapine OR lapines OR lagomorphe OR lagomorphes OR léporidé OR léporidés)

)

)

Search string Deutsch

(Entscheidungsbaum OR Entscheidungsbaums OR Entscheidungsbaumes OR Entscheidungsbäume OR Entscheidungsbäumen OR Entscheidungsdiagramm OR Entscheidungsdiagramms OR Entscheidungsdiagrammes OR Entscheidungsdiagramme OR Entscheidungsdiagrammen OR Szenariobaum OR Szenariobaums OR Szenariobaumes OR Szenariobäume OR Szenariobäumen OR "Szenario-Baum" OR "Szenario-Baums" OR "Szenario-Baumes" OR "Szenario-Bäume" OR "Szenario-Bäumen" OR risikobasiert OR risikobasierte OR risikobasiertes OR risikobasierten OR risikobasiertem)

AND

(Seuchenfreiheit)

AND

(      (      (Veterinär OR Veterinäre OR Veterinäres OR Veterinären OR Veterinärem OR Veterinärmedizinisch OR Veterinärmedizinische OR Veterinärmedizinisches OR Veterinärmedizinischen OR Veterinärmedizinischem OR Tierseuche OR Tierseuchen OR tierärztlich OR tierärztliche OR tierärztliches OR tierärztlichen OR tierärztlichem OR Tier OR Tiers OR Tieres OR Tiere OR Tieren)

OR

(Schwein OR Schweins OR Schweines OR Schweine OR Schweinen OR Eber OR Ebers OR Eberes OR Ebern OR Sau OR Sauen OR Ferkel OR Ferkels OR Ferkeles OR Ferkeln OR Wildschwein OR Wildschweins OR Wildschweines OR Wildschweine OR Wildschweinen OR Willdeber OR Willdebers OR Willdeberes OR Willdebern OR Willdsau OR Willdsauen OR Wildferkel OR Wildferkels OR Wildferkeles OR Wildferkeln  OR Borstenvieh OR Borstenviehs OR Borstenviehes OR Borstenviehe OR porzin OR porzine OR porzines OR porzinen OR porzinem)

OR

(Rind OR Rinds OR Rindes OR Rinder OR Rindern OR Stier OR Stiers OR Stieres OR Stiere OR Stieren OR Bulle OR Bulles OR Bullen OR Ochse OR Ochses OR Ochsen OR Muchse OR Muchses OR Muchsen OR Jungstier OR Jungstiers OR Jungstieres OR Jungstiere OR Jungstieren OR Jungbulle OR Jungbulles OR Jungbullen OR Kuh OR Kühe OR

Kühen OR Mutterkuh OR Mutterkühe OR Mutterkühen OR Milchkuh OR Milchkühe OR Milchkühen OR Ammenkuh OR Ammenkühe OR Ammenkühen OR Färse OR Färsen OR Kalb OR Kalbs OR Kalbes OR Kalbe OR Kälber OR Kälbern OR Jungvieh OR Jungviehs OR Jungviehes OR Jungviehe OR Milchvieh OR Milchviehs OR Milchviehes OR Milchviehe OR Galtvieh OR Galtviehs OR Galtviehes OR Galtviehe OR Wiederkäuer OR Wiederkäuern OR Bovidae OR Nutztier OR Nutztiers OR Nutztieres OR Nutztiere OR Nutztieren OR Schaf OR Schafs OR Schafes OR Schafe OR Schafen OR Ziege OR Ziegen OR ovin OR ovine OR ovines OR ovinen OR ovinem OR bovin OR bovine OR bovines OR bovinen OR bovinem OR caprin OR caprine OR caprines OR caprinen OR caprinem)

OR

(Pferd OR Pferds OR Pferdes OR Pferde OR Pferden OR Hengst OR Hengstes OR Hengste OR Hengsten OR Wallach OR Wallachs OR Wallaches OR Wallache OR Wallachen OR Stute OR Stutes OR Fohlen OR Vollblut OR Vollbluts OR Vollblutes OR Vollblute OR Vollblüter OR Vollblütern OR Halbblut OR Halbbluts OR Halbblutes OR Halbblute OR Halbblüter OR Halbblütern OR Kaltblut OR Kaltbluts OR Kaltblutes OR Kaltblute OR Kaltblüter OR Kaltblütern OR equin OR equine OR equines OR equinen OR equinem OR equidae)

OR

(Hund OR Hunds OR Hundes OR Hunde OR Hunden OR Rüde OR Rüdes OR Rüden OR Hündin OR Hündinnen OR Welpe OR Welpen OR kanin OR kanine OR kanines OR kaninen OR kaninem OR canidae OR Katze OR Katzen OR Kater OR Katers OR Katern OR Kätzin OR Kätzinnen OR felin OR feline OR felines OR felinen OR felinem OR felidae)

OR

(Vogel OR Vögel OR Vögeln OR Geflügel OR Huhn OR Hühner OR Hühnern OR Legehenne OR Legehennen OR Truthahn OR Truthahns OR Truthahne OR Truthähne OR Truthähnen OR Truthenne OR Truthennen OR Pute OR Puten OR ornithologie OR ornithologisch OR ornithologische OR ornithologisches OR ornithologischen OR ornithologischem OR ornithologe OR ornithologes OR ornithologen OR ornithologin OR ornithologinnen)

OR

(Fisch OR Fischs OR Fisches OR Fische OR Fischen OR Schalentier OR Schalentiers OR Schalentieres OR Schalentiere OR Schalentieren OR Krustentier OR Krustentiers OR Krustentieres OR Krustentiere OR Krustentieren OR Garnele OR Garnelen OR Aquakultur OR Aquakulturbetrieb OR Aquakulturbetriebs OR Aquakulturbetriebe OR Aquakulturbetrieben OR crustacea OR crustaceae)

OR

(Hirsch OR Hirschs OR Hirsches OR Hirsche OR Hirschen OR Rothirsch OR Rothirschs OR Rothirsches OR Rothirsche OR Rothirschen OR Damhirsch OR Damhirschs OR Damhirsches OR Damhirsche OR Damhirschen OR Hirschkuh OR Hirschkühe OR Hirschkühen OR Hirschkalb OR Hirschkalbs OR Hirschkalbes OR Hirschkalben OR Hirschkälber OR Hirschkälbern OR Reh OR Rehs OR Rehes OR Rehe OR Rehen OR Elch OR Elchs OR Elches OR

Elche OR Elchen OR Ren OR Rens OR Rene OR Renen OR Rentier OR Rentiers OR Rentieres OR Rentiere OR Rentieren OR Cervidae)

OR

(Biene OR Bienen OR Kaninchen OR Kaninchens OR Hase OR Hasen OR Leporidae)

)

)

Explanations

This search string is the same as the one for ProQuest, with the exception that the "curved quotation marks" were replaced by "straight quotation marks" and that truncation was removed and all spellings spelled.

# Appendix 3: Draft of the paper

# The use of scenario tree models to assess freedom from animal disease: a scoping review

Xxxx Yyyyyy[1], Gary Delalay[2], Luis Pedro Carmo[3], John Berezowski[4], Aurélien Madouasse[5], Eleftherios Meletis[6], Maria Guelbenzu[7], Petter Hopp[8]

[1] Xxxxxxxx Yyyyyyyy, Zzzzzzzzzz, Aaaaaaa, Bbbbbbb

[2] Department of Animal Health, Federal Food Safety and Veterinary Office, Bern, Switzerland

[3] Veterinary Public Health Institute, Universität Bern, Bern, Switzerland

[4] SRUC Dept of Veterinary and Animal Sciences, Inverness, Scottland

[5] BIOEPAR, INRAE, Oniris, Nantes, Frankreich

[6] Faculty of Public and One (Integrated) Health, University of Thessaly, Mavromichali st., Karditsa, 43100, Greece

[7] Animal Health Ireland, Carrick-on-Shannon, Irland

[8] Section of Epidemiology, Norwegian Veterinary Institute, Ås, Norway

## Abstract

Lorem ipsum

## Introduction

The World Trade Organization (WTO) requires in the Sanitary and Phytosanitary (SPS) agreement that member states oblige to specific rules to introduce or maintain sanitary measures impairing the international trade. Principally, these measures should be "based on scientific principles and […] not maintained without sufficient scientific evidence" (WTO, 1995). To provide sufficient scientific evidence, member states regularly assess the confidence of disease freedom in their country. Historically, this was made either by representative random sampling of the target population, which was costly and resource-intensive (CITATION), or by expert elicitation, which was subjective and could not provide high levels of confidence.

At the end of the 20th century and the beginning of the 21st, several methods were given to reduce the difficulty of the sampling or the size of the sample pool necessary to assess disease freedom, e.g. with two stage samplings (Cameron and Baldock, 1998) or by evaluating the rest of confidence of past data and/or assessments (Schlosser and Ebel, 2001; Hadorn et al., 2002).

Martin et al. (2007) provided a new method based on scenario trees to allow the combination of data from several sources—including non-random surveys—called components. Additionally, the method also allows the use of risk factors—which can help to further reduce the sample size or to achieve higher sensitivities—, the use of two (or more) stage samplings, and the assessment of the sensitivity of several detection methods in series. In particular the ability to combine data from several sources was a gamechanger, as assessments of freedom from disease were able to

use non-random data already present such as e.g. surveillance in slaughterhouse instead or in addition to targeted random sampling.

Since then, the method has been used not only by scientists but also routinely by countries or regions to assess their status of disease freedom (CITATION). The original description of the model by Martin et al. (2007) has been cited 204 times based on Scopus at the time of writing. The method was also extended to assess the effectiveness of early detection (Welby et al., 2017) or to monitor the sensitivity of surveillance systems for diseases (Hadorn and Stärk, 2008a,b, Hernández-Jover, 2011). The method has also aroused interest in other fields, e.g. to monitor antimicrobial residues (Alban et al., 2016) or to assess the success of pest eradication programs (Dominiak et al., 2016).

Several tools covering several software were also developed to help use the method. In R (R Project for Statistical Computing, RRID:SCR_001905), two distinct packages integrate this method: RSurveillance (RRID) and freedom (RRID). Functions from RSurveillance were also merged into the epiR package (RRID) in 2020 (https://cran.r-project.org/web/packages/epiR/NEWS). Other tools were also developed by taking inspiration from the method, as for instance the OptisampleTM web application (Alba et al., 2017).

However, even though guidelines for reporting results obtained from a scenario-tree model were proposed by Vanderstichel et al. in 2013, there are not widely used. Furthermore, since Martin el al. published the method in 2007, the model was used in different ways, for different purposes, and with several addenda or changes to the methods. For this reason, we designed a scoping review with the objective to map out the literature relevant to scenario tree models applied to disease freedom assessment. We aimed to provide a broad overview of the method and its variations and to answer

questions such as how scenario-tree models are used, how input parameters are estimated, how the results are reported and what the potential limitations of this method could be.

# Method

This scoping review was carried out following the PRISMA extension for scoping reviews (Tricco et al., 2018), the PRISMA extension for protocols (Moher et al., 2015) and the PRISMA 2020 abstract checklist (Page et al., 2021).

The scoping review was performed in XY steps. The protocol is available in the SUPPLEMENTARY MATERIALS (protocol).

## *Formulation of the research question*

To formulate an appropriate research question, the PICo framework (problem, interest, and context) was used (Stern et al., 2014). The problem identified was scenario-tree models, the context identified was the assessment of freedom from animal disease and the interests identified were the use and the parametrisation of such studies as well as how the results of such studies were reported. Of further interest were also potential limitations of this method. The search question was formulated as "How are scenario-tree models used and parametrised to assess freedom from animal diseases, how are the results reported, and what are the potential limitations of this method?"

## *Definition of the search strategy*

### Search strategy

To cover the problem of interest as broadly as possible, we decided to use several search strategies.

The first strategy was to search databases for published papers covering the topic. We selected 3 databases: Pubmed for its coverage of all fields of medicine including veterinary medicine, Web of Science for its broad coverage within natural science topics and CAB Direct for its coverage of agricultural sciences, global health, and veterinary sciences.

Additionally, we retrieved from Pubmed and Web of Science all publications citing one of the two publications from Martin et al. (2007a, 2007b), which first described the method respectively its application.

We also aimed to search for grey literature. It was defined at the Twelfth International Conference on Grey Literature in 2010 that "Grey literature stands for manifold document types produced on all levels of government, academics, business and industry in print and electronic formats that are protected by intellectual property rights, of sufficient quality to be collected and preserved by libraries and institutional repositories, but not controlled by commercial publishers; i.e. where publishing is not the primary activity of the producing body" (Schöpfel, 2010). We aimed to collect grey literature as we expected governments to use the method to prove freedom from animal disease without necessarily publishing the results in scientific journals. For this, we searched ProQuest (the categories Conference Papers & Proceedings, Dissertations & Theses, Government & Official Publications, Reports, and Working Papers) and NDLTD in English, French, and German.

At last, we also invited experts that had been involved in such studies to send us relevant written material. We contacted experts through the epivet mailing list (http://lists.upei.ca/mailman/listinfo/epivet), a mailing list hosted by the University of Prince Edward Island that is a common communication chanel among veterinarian epidemiologists when trying to reach the pair community.

**Search string**

From the research question, three broad elements were identified as follows: a "scenario-tree" element, a " freedom from disease " element and an "animal disease" element. The outline of the general search string was defined by mapping the terms that could correspond to each element and by linking them together within the same element with the bolean operator OR, and by linking the three elements together with the bolean operator AND (see TABLE # (general outline of search string))

Then, we adapted the general outline of our search string to each database, taking advantage of the specificities of each database to increase the sensitivity and specificity of our search strings (see SUPPLEMENTARY MATERIALS (protocol)).

For ProQuest and NDLTD, the adapted search strings were also translated into French and German.

The dates the searches were conducted are given in Table Y1.The number of articles retrieved from each database can be found in the flowchart of our scoping review in FIGURE ## (flow diagram).

**Epivet maillist**

The mail to the epivet mailing list was sent on the 2021-06-08. It was answered by six experts who submitted us six articles or other written material. In addition, four experts provided us with the contacts for studies and projects for which they had not the rights to give us any material. We asked for the material for the two studies that were unknown from us. From these, we could retrieve material from XX of them, increasing the total of articles and other material retrieved by the call to experts to YY (Figure ## (flow diagram)).

*Screening*

All articles as well as the other material were screened by two reviewers. G. Delalay and <mark>X. YYYY</mark> served as first reviewer for the title and abstract screening respectively for the full text screening. The remaining co-authors (and G. Delalay for the full text screening) split the papers between themselves and served as second reviewer.

**Title and abstract screening**

For the title and abstract screening, a very sensitive screening was performed following these criteria:

a) the publication is neither a review nor an expert opinion;

b) the publication aims to assess disease freedom, provides methods to assess it, or aims to detect a disease at a low prevalence;

c) the publication targets animal diseases; and

d) the publication uses or describes the use of scenario tree models or compares its use with the use of other methods, or it is considered credible that the publication uses, describes, or compares this method.

For a reviewer to declare credible that a publication uses, describes, or compares scenario-tree models, the title or abstract of the publication should mention either a risk-based methodology or the aggregation of data from several surveillance components or data sources.

Before the title and abstract screening, a correlation exercise was performed on 13 papers (6 journal articles, 4 thesis and 3 reports) which were selected for their presumed difficulty to categorize. The results were discussed together and allowed us to clarify the criteria.

Conflicts were resolved by consensual discussion between both reviewers. When consensus could not be found, the publication was included to the full text screening.

**Full text screening**

For the full text screening, criteria were defined to increase the specificity as follows: a) the publication is neither a review nor an expert opinion; b) the publication aims to assess disease freedom or provides methods to assess it; c) the publication targets animal diseases; and d) the publication uses or describes the use of scenario tree models or compares its use with the use of other methods.

Before the full text screening and data extraction, a correlation exercise was performed again between the YY reviewers, lorem ipsum dolor sit amet.

*Indexing the studies*

After the screening process, the remaining publications were assessed to characterise the study or studies they describe. A study was defined as follows:

a)  A clinical study is a study that assesses the freedom of: 1) one and only one disease, 2) in one and only one geographic level, 3) with one and only one scenario-tree, and 4) provides one and only one result for a given time point, given either as a single value or as a distribution probability.

b)  A methodological study is a study that: 1) presents methodological changes to the original method from Martin et al (2007), or 2) provides methods to extend the field of its application.

Studies that could fit both into the definition a) and b) were considered as one study with a clinical and a methodological aspect.

Given this definition, an article could include several studies (e.g. Christensen et al., 2014), but one study could also be referred by several materials (e.g. Wahlström et al., 2011a,b).

All studies identified were given a unique identifier. The extraction and the data analysis were performed at the study level and not at the publication level.

*Data extraction*

<mark>Next point</mark>

*Data analysis*

The data were extracted in a Microsoft Excel Spreadsheet (RRID:SCR_016137). The data were loaded on R with the package openxlsx (RRID:SCR_019185) and analysed with several packages of the tidyverse (RRID:SCR_019185). The map and figures were produced with ggplot2 (RRID:SCR_014601). The flow diagram was drawn with the web application diagrams.net (diagrams.net, n.d.).

# Results

*Studies description*

<mark>Table X1</mark>

<mark>Figure X1</mark>

*Models*

<mark>Table X2</mark>

*Parameters*

<mark>Table X3a and Table X3b</mark>

*Results*

<mark>Table X4</mark>

*Reporting*

<mark>Table X5</mark>

# Discussion

*First heading and some random text*

Lorem ipsum dolor sit amet

*Bad practices identified*

*Potential gaps and weaknesses of the method*

# Conclusion

<mark>Lorem ipsum</mark>

# References

Alba, A., Morrison, R. E., Cheeran, A., Rovira, A., Alvarez, J., & Perez, A. M. (2017). OptisampleTM: Open web-based application to optimize sampling strategies for active  surveillance activities at the herd level illustrated using Porcine Respiratory Reproductive Syndrome (PRRS). *PloS One*, *12*(7), e0176863. https://doi.org/10.1371/journal.pone.0176863

Alban, L., Rugbjerg, H., Petersen, J. V., & Nielsen, L. R. (2016). Comparison of risk-based versus random sampling in the monitoring of antimicrobial  residues in Danish finishing pigs. *Preventive Veterinary Medicine*, *128*, 87–94. https://doi.org/10.1016/j.prevetmed.2016.04.007

Cameron, A. R., & Baldock, F. C. (1998). Two-stage sampling in surveys to substantiate freedom from disease. *Preventive Veterinary Medicine*, *34*(1), 19–30. https://doi.org/https://doi.org/10.1016/S0167-5877(97)00073-1

Christensen, J., El Allaki, F., & Vallières, A. (2014). Adapting a scenario tree model for freedom from disease as surveillance progresses:  the Canadian notifiable avian influenza model. *Preventive Veterinary Medicine*, *114*(2), 132–144. https://doi.org/10.1016/j.prevetmed.2014.01.023

diagrams.net. (n.d.). *diagrams.net*. Retrieved August 27, 2021, from https://www.diagrams.net/

Dominiak, B. C., Gott, K., McIver, D., Grant, T., Gillespie, P. S., Worsley, P., Clift, A., & Sergeant, E. S. G. (2011). Scenario tree risk analysis of zero detections and the eradication of yellow crazy ant (Anoplolepis gracilipes (Smith)), in New South Wales, Australia. *Plant Protection Quarterly*, *26*(4), 124–129.

Hadorn, D. C., Rüfenacht, J., Hauser, R., & Stärk, K. D. C. (2002). Risk-based design of repeated surveys for the documentation of freedom from non-highly contagious diseases. *Preventive Veterinary Medicine*, *56*(3), 179–192. https://doi.org/https://doi.org/10.1016/S0167-5877(02)00193-9

Hadorn  C., D., & Stärk  D.C., K. (2008). Evaluation and optimization of surveillance systems for rare and emerging infectious diseases. *Vet. Res.*, *39*(6). https://doi.org/10.1051/vetres:2008033

Hadorn, D. C., Haracic, S. S., & Stärk, K. D. C. (2008). Comparative assessment of passive surveillance in disease-free and endemic situation: example of Brucella melitensis surveillance in Switzerland and in Bosnia and Herzegovina. *BMC Veterinary Research*, *4*, 52. https://doi.org/10.1186/1746-6148-4-52

Hernández-Jover, M., Cogger, N., Martin, P. A. J., Schembri, N., Holyoake, P. K., & Toribio, J.-A. L. M. L. (2011). Evaluation of post-farm-gate passive surveillance in swine for the detection of foot and mouth disease in Australia. *PREVENTIVE VETERINARY MEDICINE*, *100*(3–4), 171–186. https://doi.org/10.1016/j.prevetmed.2011.03.011

Martin, P. A. J., Cameron, A. R., & Greiner, M. (2007). Demonstrating freedom from disease using multiple complex data sources 1: a new methodology based on scenario trees. Preventive Veterinary Medicine, 79(2–4), 71–97. https://doi.org/10.1016/j.prevetmed.2006.09.008

Martin, P. A. J., Cameron, A. R., Barfod, K., Sergeant, E. S. G., & Greiner, M. (2007). Demonstrating freedom from disease using multiple complex data sources 2: case study--classical swine fever in Denmark. Preventive Veterinary Medicine, 79(2–4), 98–115. https://doi.org/10.1016/j.prevetmed.2006.09.007

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., Stewart, L. A., & Group, P.-P. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Systematic Reviews, 4(1), 1. https://doi.org/10.1186/2046-4053-4-1

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Systematic Reviews, 10(1), 89. https://doi.org/10.1186/s13643-021-01626-4

Schlosser, W., & Ebel, E. (2001). Use of a Markov-chain Monte Carlo model to evaluate the time value of historical testing information in animal populations. *Preventive Veterinary Medicine*, *48*(3), 167–175. https://doi.org/https://doi.org/10.1016/S0167-5877(00)00194-X

Stern, C., Jordan, Z., & McArthur, A. (2014). Developing the Review Question and Inclusion Criteria. AJN The American Journal of Nursing, 114(4). https://doi.org/10.1097/01.NAJ.0000445689.67800.86

Joachim Schöpfel. Towards a Prague Definition of Grey Literature. Twelfth International Conference on Grey Literature: Transparency in Grey Literature. Grey Tech Approaches to High Tech Issues. Prague, 6-7 December 2010, Dec 2010, Czech Republic. pp.11-26. ffsic_00581570f

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., … Straus, S. E. (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Annals of Internal Medicine, 169(7), 467–473. https://doi.org/10.7326/M18-0850

Vanderstichel, R., Christensen, J., Stryhn, H., & Hurnik, D. (2013). Standards for reporting surveillance information in freedom from infection models by example of Trichinella in Canadian market hogs. *PREVENTIVE VETERINARY MEDICINE*, *111*(1–2), 176–180. https://doi.org/10.1016/j.prevetmed.2013.03.012

Wahlström, H., Isomursu, M., Hallgren, G., Christensson, D., Cedersmyg, M., Wallensten, A., Hjertqvist, M., Davidson, R. K., Uhlhorn, H., & Hopp, P. (2011). Combining information from surveys of several species to estimate the probability of freedom from Echinococcus multilocularis in Sweden, Finland and mainland Norway. *ACTA VETERINARIA SCANDINAVICA*, *53*(1), 9. https://doi.org/10.1186/1751-0147-53-9

Wahlström, H., Isomursu, M., Hallgren, G., Christensson, D., Cedersmyg, M., Wallensten, A., Hjertqvist, M., Uhlhorn, H., Davidson, R., & Hopp, P. (2011). Demonstrating freedom from Echinococcus multilocularis in Sweden, Finland and mainland Norway using species specific design prevalences. *EPIDEMIOLOGIE ET SANTE ANIMALE, NO 59-60*, *59–60*, 75–77.

Welby, S., van Schaik, G., Veldhuis, A., Brouwer-Middelesch, H., Peroz, C., Santman-Berends, I. M., Fourichon, C., Wever, P., & Van der Stede, Y. (2017). Effectiveness and Cost Efficiency of Different Surveillance Components for Proving Freedom and Early Detection of Disease: Bluetongue Serotype 8 in Cattle as Case Study for Belgium, France and the Netherlands. *Transboundary and Emerging Diseases*, *64*(6), 1771–1781. https://doi.org/10.1111/tbed.12564

WTO, **Agreement on the Application of Sanitary and Phytosanitary Measures**, World Trade Organization (1995), http://www.wto.org

# Tables

*Table 1*

General outline of the search string

*Table Y1*

Search strategies and date of search

| Search tool or database | Description | Search strategy | Date the search was performed* |
|---|---|---|---|
| Pubmed | Database, which comprises medical literature from MEDLINE, life science journals and online books. | Search string | 2021-07-15 |
| | | Papers citing Martin et al. (2007a,b) | 2021-07-16 |
| Web of Science | Web of Science is a database, which aims to collect literature from all fields of science. | Search string | 2021-07-15 |
| | | Papers citing Martin et al. (2007a,b) | 2021-07-16 |
| CAB Direct | CAB Direct is a database, which aims to be an extensive source of reference in the | Search string | 2021-08-11 |

| | | | |
|---|---|---|---|
| | applied life sciences. | | |
| ProQuest | ProQuest is a database, which aims to collect diverse material including grey literature in multiple fields of science. | Search string in French and German | 2021-07-15 |
| | | Search string in English | 2021-07-16 |
| NDLTD | NDLTD is a databases, which aims to preserve and disseminate theses and dissertations. | Search string | 2021-07-15 |
| Epivet Mailing List | The Epivet mailing list is hosted by the University of Prince Edward Island and is a common communication chanel among | Call for material from experts | 2021-06-08 |

| | veterinarian epidemiologists. | | |
|---|---|---|---|

*Expressed according to ISO 8601

*Table X1*

Overview of the XX different studies included in the review

| Categories | Characteristics | Number of studies |
|---|---|---|
| Study type | Disease freedom assessment | X |
| | Methodological studies | Y |
| | Comparison of scenario-tree modelling with other methods | Z |
| Disease of interest | OIE-regulated diseases | X |
| | EU-regulated diseases | Y |
| | Non-regulated diseases | Z |
| Population sampled | Farmed animals | X |
| | Wild animals | Y |
| | Pets | Z |
| Geographic level | National | X |
| | International | Y |

| | Regional | Z |
|---|---|---|
| | Herd | A |
| Type of surveillance | Active surveillance | X |
| | Passive surveillance | Y |
| | Both | Z |
| Duration | Mean duration* of the study | X |
| | Median duration* of the study | Y |
| | Maximum duration* of the study | Z |
| | Minimum duration* of the study | A |
| Other ideas? | | |
| | | |

*Duration is defined as the elapsed time in year between the timepoint the first and the last data used in the study originate.

*Table X2*

Presentation of the characteristics of the scenario-tree models used in the <mark>XX</mark> studies in our review.

| Categories | Characteristics | Number of studies |
|---|---|---|
| Stochasticity | Deterministic model | X |
| | Stochastic model | Y |
| Inference type | Frequentist probabilities* | X |

| | Bayesian probabilities | Y |
|---|---|---|
| Outline of the scenario-tree | Different components are used | X |
| | Mean, median, maximum and minimum number of components used** | |
| | Different infection nodes are used | Y |
| | Mean, median, maximum and minimum number of infection nodes used** | |
| | Risk factors are used | Z |
| | Mean, median, maximum and minimum number of risk factors used** | |
| | Different detection nodes are used | A |
| | Mean, median, maximum and minimum number of detection nodes used** | |
| Confidence over time | Assessment of the confidence only at the end of the study | X |
| | Assessment of the confidence at several time | Y |

| | | |
|---|---|---|
| | points with risk of introduction between timepoints | |
| Formula used | Binomial formula*** | X |
| | Hypergeometric approximation**** | Y |
| | Both | Z |
| Uncertainty | Uncertainty of the estimations of all the parameters considered for the calculation | X |
| | Uncertainty of the estimations of some of the parameters considered for the calculation | Y |
| | Uncertainty of the estimations of the parameters never considered for the calculation | Z |
| Other ideas? | | |
| | | |

*The Bayes theorem is used in all models. However, it can be either used in a frequentist philosophy or in a true Bayesian philosophy.

**Only studies which used these parameters were considered.

***As described in Martin et al. (2007)

****As described in XXX et al. (YYYY)

*Table X3a*

Description of the sources used for the estimation of parameters for the XX studies in our review

| | Categories | Characteristics | Estimation based on published data | Estimation based on laboratory, unpublished data | Estimation based on other unpublished data | Estimation based on an expert elicitation | Estimation based on a risk assessment | Estimation based on international agreements | Estimation based on recommendations from the OIE |
|---|---|---|---|---|---|---|---|---|---|
| Number of studies | Risk factors | Definition | / | | | | | | |
| | | Weight | / | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Detection nodes | Diagnostic tests sensitivity | | | | | / | / | / |
| | Sensitivity of other detection nodes | | | | | / | / | / |
| | Risk of introduction | | / | | | | | |
| Prevalence | Design prevalence | | / | | | / | | |
| | In-herd prevalence | | / | | | / | | |
| | Confidence needed to | | / | | / | / | | |

| | declare freedom | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

*Table X3b*

Overview of the number of parameters for the <mark>XX</mark> studies in our review and of the confidence of their estimates

| Categories | Characteristics | Number of studies |
|---|---|---|
| Number of parameters to be estimated per study | Mean | X |
| | Median | Y |
| | Maximum | Z |
| | Minimum | A |
| Confidence in parameter estimation | Parameters were expressed as single values | X |
| | Parameters were expressed as probability distributions | Y |
| | Some parameters were expressed as single values, others as probability distributions | Z |
| Covariance of diagnostic tests | Percentage of studies in which the covariance of | XX% |

| | diagnostic tests in series were assessed* | |
|---|---|---|
| Other ideas? | | |
| | | |

*Studies were only considered for the calculations when they had at least on a branch several diagnostic tests in series.

## *Table X4*

Description of how the results of the XX studies in our review were reported

| Categories | Characteristics | Number of studies |
|---|---|---|
| Confidence needed to declare freedom | Most-used value | X |
| | Minimum | Y |
| | Maximum | Z |
| Confidence reached at the end of the study | Percentage of studies which express the confidence of freedom as a single value / as a probability definition | XX% / YY% |
| Declaration of disease freedom | Percentage of studies that took position about the freedom status* | XX% |
| | Percentage of studies taking position that achieved to prove disease freedom | YY% |
| Other ideas? | | |

| | | |
|---|---|---|
| | | |

*Were considered taking position studies in which the authors stated that the population of interest is free or not of the disease or commented that there is a high probability that the population of interest is free or not of the disease. Were considered not taking position studies in which authors simply gave the probability of disease freedom for the population of interest without commenting it.

*Table X5*

Description of how the XX studies in our review were presented to the scientific community

| Categories | Sub-categories | Characteristics | Number of studies |
|---|---|---|---|
| Study | Reporting form | Article in a scientific journal | X |
| | | Conference presentation | Y |
| | | Poster | Z |
| | | Thesis | A |
| | | Report | B |
| | Number of occurrences a study was reported | Mean | X |
| | | Median | Y |
| | | Maximum | Z |
| | | Minimum | 1 |

| Guidelines | Publications** that followed the guidelines recommended by Vanderstichel et al. (2013) | Percentage of publications** that followed the reporting table, excluding the validity and the sensitivity analysis | XX% |
|---|---|---|---|
| | | Percentage of publications** that showed a diagram the scenario-tree | |
| | | Percentage of the publications** that presented the model validation, including biological and technical validity and sensitivity analysis | |
| Parameters | Definition of the parameters | Number of studies that reported the definition of all their parameters | XX from AA (BB%) |
| | Estimation of the parameters | Number of studies that reported all the values and probability | YY from AA (CC%) |

|  | Source for the estimation of the parameters | distribution attributed to the parameters |  |
|---|---|---|---|
|  |  | Number of studies that always reported the source used to base the estimation of the parameters on | ZZ from AA (DD%) |
| Include fields for qualitative data? |  |  |  |
| Or qualitative data only in the text? |  |  |  |
|  |  |  |  |
| Other ideas? |  |  |  |
|  |  |  |  |

**Were only considered publications published after the article of Vanderstichel et al. (2013) that were published in scientific journals.

# Figures

*Figure 1*

Flow diagram documenting the process of literature retrieval and selection

*Figure X1*

World map representing where disease freedom was assessed with scenario-tree models (filled area). The coloured dots/bars/whatever represent the diseases for which

freedom from was assessed. The coloured areas only represent the country in which the study was performed, and not necessarily the actual geographic area for which disease freedom was assessed, which could be regional for instance.
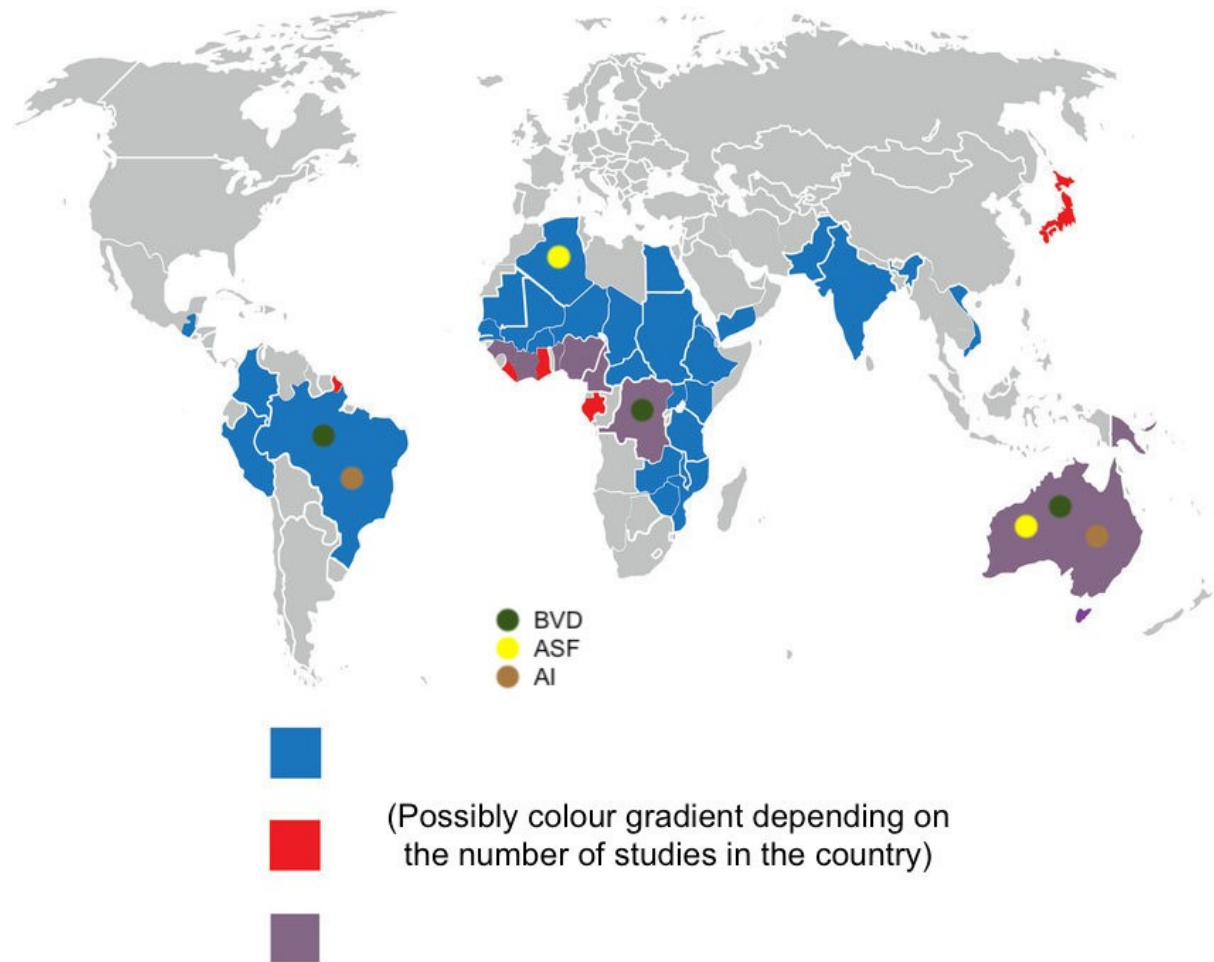


*1 Example of what a potential figure for this purpose could look like*

# Supplementary material

*Protocol*

Lorem ipsum

# Appendix 4: Extraction form

| | | | Study ID | | |
| | | | Author(s) | | |
| | | | Paper/Material 1 | | |
| | | | Paper/Material 2 | | |
| | | | Paper/Material 3 | | |
|---|---|---|---|---|---|
| Study characteristics | Objectives | | Does the study assess disease freedom? | Yes/No | stu_disfrea |
| | | | Does the study evaluate the prevalence of a disease? | Yes/No | stu_disprev |
| | | | Does the study provides methodological improvements to the method? | Yes/No | stu_meth |
| | | | Does the study compare scenario-tree modelling with other methods? | Yes/No | stu_comp |
| | | | Does the study provides guidelines to describe or report information about a scenario tree model (e.g. results, updating, outline of the tree…)? | Yes/No | stu_guid |
| | | | Does the study have another purpose than the ones cited before? | Yes/No | stu_other |
| | | | If the study has another purpose than the ones cited before, which is it? | Free text | stu_other_tex |
| | Publication form | | Was the study published in a scientific journal article? | Yes/No | pub_article |
| | | | Was the study presented at a conference? | Yes/No | pub_conf |
| | | | Was the study part of a thesis? | Yes/No | pub_thes |
| | | | Was the study presented on a poster? | Yes/No | pub_post |
| | | | Was the study described on an internal documentation we could access? | Yes/No | pub_intern |
| | | | Was the study described on a public report? | Yes/No | pub_report |
| | | | Was the study presented in another way? | Yes/No | pub_other |
| | | | If the study was presented in another way, what way was it? | Free text | pub_other_text |
| | Geography | | Geographic level | 1=national, 2=regional, 3=international, 4=other, 0=not applicable | geo_lvl |
| | | | If other, which level? | Free text | |
| | | | Country/ies of interest | Free text | country |
| | Population | | Were farmed animals part of the study? | Yes/No/0=not applicable/9=unknown | pop_farm |
| | | | Were wild animals part of the study? | Yes/No/0=not applicable/9=unknown | pop_wild |
| | | | Were pets part of the study? | Yes/No/0=not applicable/9=unknown | pop_pet |
| | | | Were other animals (zoo, etc) part of the study? | Yes/No/0=not applicable/9=unknown | pop_other |
| | | | Which species were included in the study? | Free text | species |
| | Disease | | Disease of interest (only 1, else several rows for the study) | Free text | disease |
| | Time | | Does the data from the study originates from a single point in time? | Yes/No/0=not applicable/9=unknown | time_fix |
| | | | Duration of the study | positive numeric value, unit=year (only fill if applicable) | time_dur |
| | | | Begin | Year (only fill if applicable), 9=unknown | time_beg |
| | | | End | Year (only fill if applicable), 9=unknown | time_end |
| Methods | Scenario tree outline | Components | Different components used | Yes/No/0=not applicable/9=unknown | scen_comp |
| | | | Number of components | numeric | comp_num |
| | | | Names of the components | Free text | comp_names |
| | | | Was the whole population covered by the different components? | Yes/No/0=not applicable/9=unknown | |
| | | | Were different components overlapping? | Yes/No/0=not applicable/9=unknown | comp_overlap |
| | | | Was the overlap of the components taken into consideration? | Yes/No/0=not applicable/9=unknown | comp_overlap |
| | | | How was it dealt with this overlap? | 1=as proposed by Martin et al., 2=other, 0=not applicable, 9=unknown | comp_overlap |
| | | Risk factors | Risk factors used | Yes/No/0=not applicable/9=unknown | scen_rf |
| | | | Number of risk factors | numeric | rf_num |
| | | | Names of risk factor (and number of levels) | Free text | rf_names |
| | | Infection nodes | Infection nodes used | Yes/No/0=not applicable/9=unknown | scen_inf |
| | | | Number of infection levels | numeric | inf_num |
| | | | Names of infection levels | Free text | inf_names |
| | | Detection nodes | Were different detection methods integrated as different detection nodes or were there aggregated together as one node for detection? | 1=different detection nodes, 2=aggregated together, 3=unknown, 0=not applicable | det_comb |
| | | | Detection nodes (laboratory tests excluded) used | Yes/No/0=not applicable/9=unknown | scen_det |
| | | | Number of detection nodes (laboratory tests excluded) | numeric | det_num |
| | | | Names of detection nodes (laboratory tests excluded) | Free text | det_names |
| | | | Laboratory tests used | Yes/No/0=not applicable/9=unknown | scen_diagn |
| | | | Number of laboratory tests | numeric | diagn_num |
| | | | Names of laboratory tests | Free text | diagn_names |
| | | Repeated surveys | Does the study involve regular reevaluation with increase in confidence? | Yes/No/0=not applicable | time_rep |
| | | | Did the study involve risk of reintroduction between the timesteps? | Yes/No/Unknown (only fill if applicable) | time_rintro |
| | | | Timestep | 1=year, 2=month, 3=other (only fill if applicable) | |
| | | | If another timestep, what is it? | Free text | time_timeste |
| | Model type | Statistical philosophy | Is the model deterministic or stochastic? | 1=deterministic, 2=stochastic, 0=not applicable, 9=unknown | deterministic |
| | | Statistical inference | Is the model frequentist or bayesian? | 1=frequentist, 2=bayesian, 0=not applicable, 9=unknown | frequentist |
| | | Formula type | Did the model used the binomial formula or the hypergeometric approximation? | 1=binomial, 2=hypergeometric, 3=both, 4=other, 0=not applicable, 9=unknown | form_type |
| | | | If the model uses another formula than the binomial or its hypergeometric approximation, what is it? | Free text | form_other |
| | | | Were small populations (=assumption population infinite size not met) sampled in the study? | Yes/No/0=not applicable/9=unknown | sample_size |
| | | | At which level was the small population? (Few XXX in the YYY) | Free text | sample_small |

| | | | Question | Answer options | Variable |
|---|---|---|---|---|---|
| | | | How was the prevalence defined for these small populations? | 1=prevalence not rounded (R "freedom"), 2=rounded above (R "RSurveillance"), 3=when below 1 rounded to 1, else rounded below, 4=when below 1 rounded to 1, else rounded with .5 rule, 5=when below rounded to 1, else using the exact prevalence value without rounding, 0=not applicable, 9=unknown | sample_small |
| | Surveillance characteristics | Surveillance system Sampling method | Is active surveillance used? | Yes/No/0=not applicable/9=unknown | surv_act |
| | | | Is passive surveillance used? | Yes/No/0=not applicable/9=unknown | surv_pass |
| | | | Is convenient sampling used? | Yes/No/0=not applicable/9=unknown | samp_conv |
| | | | Is targeted sampling used? | Yes/No/0=not applicable/9=unknown | samp_targ |
| | | | Are random samples used? | Yes/No/0=not applicable/9=unknown | samp_rdm |
| | | | Are non-random samples used? | Yes/No/0=not applicable/9=unknown | samp_nrdm |
| | | | Are healthy, asymptomatic animals sampled? | Yes/No/0=not applicable/9=unknown | samp_asym |
| | | | Are symptomatic animals sampled? | Yes/No/0=not applicable/9=unknown | samp_sym |
| | | | Are dead carcasses (excluding slaughterhouse) sampled? | Yes/No/0=not applicable/9=unknown | samp_dead |
| | | | Are animals sampled at the slaughterhouse? | Yes/No/0=not applicable/9=unknown | samp_slau |
| | Methodological improvments | | Are changes from the original method implemented? | Yes/No/0=not applicable/9=unknown | meth_change |
| | | | What are these changes? | Free text | meth_text |
| Parameters | Risk factors | Selection and definition of the risk factors | Were risk factors selected and defined based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | rf_sel_exp |
| | | | Were risk factors selected and defined based on published studies? | Yes/No/0=not applicable/9=unknown | rf_sel_pub |
| | | | Were risk factors selected and defined based on raw, unpublished data? | Yes/No/0=not applicable/9=unknown | rf_sel_raw |
| | | | Were risk factors selected and defined based on international requirements? | Yes/No/0=not applicable/9=unknown | rf_sel_int |
| | | | Were risk factors selected and defined based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | rf_sel_own |
| | | | Were risk factors selected and defined based on other source of information? | Free text | rf_sel_other |
| | | Weight of the risk factors | Were risk factors weighted based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | rf_weight_exp |
| | | | Were risk factors weighted based on published data? | Yes/No/0=not applicable/9=unknown | rf_weight_pu |
| | | | Were risk factors weighted based on raw, unpublished data? | Yes/No/0=not applicable/9=unknown | rf_weight_ra |
| | | | Were risk factors weighted based on a risk assessment? | Yes/No/0=not applicable/9=unknown | rf_weight_ras |
| | | | Were risk factors weighted based on other source of information? | Free text | rf_weight_oth |
| | Detection sensitivity and specificity | Detection node sensitivity (excluding laboratory diagnostic tests) | Was the sensitivity of the detection nodes (excluding laboratory tests) estimated based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | det_exp |
| | | | Was the sensitivity of the detection nodes (excluding laboratory tests) estimated based on published data? | Yes/No/0=not applicable/9=unknown | det_pub |
| | | | Was the sensitivity of the detection nodes (excluding laboratory tests) estimated based on a raw, unpublished data? | Yes/No/0=not applicable/9=unknown | det_raw |
| | | | Was the sensitivity of the detection nodes (excluding laboratory tests) estimated based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | det_own |
| | | | Was the sensitivity of the detection nodes (excluding laboratory tests) estimated based on other source of information? | Free text | det_other |
| | | Dignostic test sensitivity | Was the sensitivity of diagnostic tests estimated based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | diagn_exp |
| | | | Was the sensitivity of diagnostic tests estimated based on published data? | Yes/No/0=not applicable/9=unknown | diagn_pub |
| | | | Was the sensitivity of diagnostic tests estimated based on a raw, unpublished data (excluding labor data)? | Yes/No/0=not applicable/9=unknown | diagn_raw |
| | | | Was the sensitivity of diagnostic tests estimated based on labor data? | Yes/No/0=not applicable/9=unknown | diagn_lab |
| | | | Was the sensitivity of diagnostic tests estimated based on other source of information? | Free text | diagn_other |
| | | Detection specificity | Was the specificity of the detection equal to 1? | Yes/No/0=not applicable/9=unknown | sp_one |
| | | | Was the specificity estimated based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | sp_exp |
| | | | Was the specificity estimated based on published data? | Yes/No/0=not applicable/9=unknown | sp_pub |
| | | | Was the specificity estimated based on raw, unpublished data (excluding labor data)? | Yes/No/0=not applicable/9=unknown | sp_raw |
| | | | Was the specificity estimated based on labor data? | Yes/No/0=not applicable/9=unknown | sp_lab |
| | | | Was the specificity estimated based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | sp_own |
| | | | Was the specificity estimated based on other source of information? | Yes/No/0=not applicable/9=unknown | sp_other |
| | | | If the specificity was estimated based on other source of information, what was it? | Free text | sp_other_text |
| | | Covariance | Was the covariance of the different diagnostic tests evaluated? | Yes/No/0=not applicable/9=unknown | diagn_cov |
| | | | How was the covariance assessed? | Free text | diagn_cov_te |
| | Reassessment over time | Risk of disease introduction | Was the risk of disease introduction evaluated based on a formal expert elicitation (excluding risk assessment)? | Yes/No/0=not applicable/9=unknown | rint_exp |
| | | | Was the risk of disease introduction evaluated based on published data? | Yes/No/0=not applicable/9=unknown | rint_pub |
| | | | Was the risk of disease introduction evaluated based on raw, unpublished data? | Yes/No/0=not applicable/9=unknown | rint_raw |
| | | | Was the risk of disease introduction evaluated based on a risk assessment? | Yes/No/0=not applicable/9=unknown | rint_rass |
| | | | Was the risk of disease introduction evaluated based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | rint_own |
| | | | Was the risk of disease introduction based on the estimation of authors from another study? | Yes/No/0=not applicable/9=unknown | rint_auth |
| | | | Was the risk of disease introduction evaluated based on other source of information? | Yes/No/0=not applicable/9=unknown | rint_other |
| | | | If the risk of disease introduction was evaluated based on other source of information, what was it? | Free text | rint_other_te |

| | | | | | |
|---|---|---|---|---|---|
| | | Prior of disease freedom | Was the prior probability of infection a fixed value? | Yes/No/0=not applicable/9=unknown | prior_fix |
| | | | Was the prior probability of infection a probability distribution? | Yes/No/0=not applicable/9=unknown | prior_dist |
| | | | What was the prior probability of infection? | numeric/probability distribution (only fill if applicable) | prior_val |
| | Prevalence values | Design prevalence | Was the design prevalence estimated based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | prev_d_exp |
| | | | Was the design prevalence estimated based on published data? | Yes/No/0=not applicable/9=unknown | prev_d_pub |
| | | | Was the design prevalence estimated based on raw, unpublished data? | Yes/No/0=not applicable/9=unknown | prev_d_raw |
| | | | Was the design prevalence estimated based on international requirements? | Yes/No/0=not applicable/9=unknown | prev_d_int |
| | | | Was the design prevalence estimated based on international organizations (OIE, EFSA...)? | Yes/No/0=not applicable/9=unknown | prev_d_org |
| | | | Was the design prevalence estimated based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | prev_d_own |
| | | | Was the design prevalence estimated based on other source of information? | Yes/No/0=not applicable/9=unknown | prev_d_other |
| | | | What were the other sources of information? | Free text | prev_d_other |
| | | | What was the design prevalence? | numeric (only fill if applicable) | prev_d_val |
| | | In-herd prevalence | Was the in-herd prevalence estimated based on a formal expert elicitation? | Yes/No/0=not applicable/9=unknown | prev_ih_exp |
| | | | Was the in-herd prevalence estimated based on published data? | Yes/No/0=not applicable/9=unknown | prev_ih_pub |
| | | | Was the in-herd prevalence estimated based on raw, unpublished data? | Yes/No/0=not applicable/9=unknown | prev_ih_raw |
| | | | Was the in-herd prevalence estimated based on international requirements? | Yes/No/0=not applicable/9=unknown | prev_iv_int |
| | | | Was the in-herd prevalence estimated based on the own estimation of the authors? | Yes/No/0=not applicable/9=unknown | prev_ih_own |
| | | | Was the in-herd prevalence estimated based on other source of information? | Free text | prev_ih_othe |
| | | | What was the in-herd prevalence? | numeric (only fill if applicable) | prev_ih_val |
| | Confidence of the model | | Did parameters had to be estimated for the model? | Yes/No/0=not applicable/9=unknown | par_eval |
| | | | How many parameters had to be estimated for the model? | numeric (only fill if applicable) | par_num |
| | | | Were all the parameters defined? | Yes/No/0=not applicable | par_def |
| | | | Were the values/distributions attributed to parameters all reported? | Yes/No/0=not applicable | par_val |
| | | | Were single values assigned to parameters? | Yes/No/9=unknown (only fill if applicable) | par_sing |
| | | | Which parameters were assigned a single value? | Free text (only fill if applicable) | par_sing_text |
| | | | Were probability distributions assigned to parameters? | Yes/No/9=unknown (only fill if applicable) | par_dist |
| | | | Which parameters were assigned a probability distribution? | Free text (only fill if applicable) | par_dist_text |
| | | | Was the confidence/credibility of the estimated parameters assessed? | Yes/No/Somewhat/0=not applicable/9=unknown | par_conf |
| | | | How did the authors deal with the confidence of the estimation of the parameters? | Free text | par_conf_text |
| | | | Was the confidence of the results corrected to take in consideration the confidence of the estimated parameters? | Yes/No/Somewhat/0=not applicable/9=unknown | par_corr |
| | | | How was the confidence of the results corrected? | Free text | |
| | | | Was a sensitivity analysis conducted on the model to assess the influence of the inputs (parameters with uncertainty) on the final outputs (for instance with spider plot)? | Yes/No/0=not applicable/9=unknown | par_corr_text |
| Results | | | Was a confidence interval value defined as cut-off for freedom from disease? | Yes/No/0=not applicable/9=unknown | conf_cutoff |
| | | | What was the cut-off value of the confidence interval? | numeric bounded between 0 and 1 (only fill if applicable) | conf_cutoff_v |
| | | | Is the confidence at the end of the study a single value or a probability distribution? | 1=single value, 2=probability distribution, 0=not applicable, 9=unknown | conf_val_cat |
| | | | What was the confidence reached at the end of the study? | numeric bounded between 0 and 1 (only fill if applicable) | conf_val |
| | | | If the confidence at the end of the study is given as a probability distribution, how did the authors define which value use to compare with the cut-off? | Free text | conf_val_dist |
| | | | Was the assessed population declared free of the disease? | Yes/No/0=not applicable/9=unknown | freedom |
| Limitations | | | | Free text | limitations |