

UTOPIA: a user-friendly tool for evaluating the risk of introducing animal diseases through commercial transactions

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Background:

- The introduction of exotic animal diseases can cause widespread epidemics with severe economic impacts
- There is a need for user-friendly tools to support risk management decisions
- Legal imports of live animals and animal products/by-products are recorded in the European regulatory database TRACES-NT but data is complex, the query methods can be laborious and their analysis is long and a source of errors through misuse

→ UTOPIA (User-friendly Tool for Outbreak Prevention and Introduction Assessment) has been developed in collaboration with French end-users to leverage TRACES-NT data from an epidemiological perspective. It offers two key functionalities:

ANNUAL RISK ASSESSMENT

Objective

To enable a country to identify high-risk trade routes each year and prioritize exotic diseases from global commerce

Methodology

- France was taken as an example
- Inspired by Rapid risk assessment tool (RRAT) ¹
- Semi-quantitative risk scores calculated using a Binomial process:

$$OR_{Dr} = 1 - \prod_{C=1}^c \prod_{M=1}^m (1 - P_{entry_{CMD}} \times P_{spr_{MD}})^{N_{CM}}$$

OR_{Dr}: Overall risk of introduction (including transmission to ≥1 local animal) of disease D by route r (for all imported merchandises)

P_{entry_{CM}}: Probability that a merchandise M is infected by disease D when entering France from country C

P_{spr_{MD}}: Probability that such an entry results in the disease spread in France (= first infection of at least one local animal)

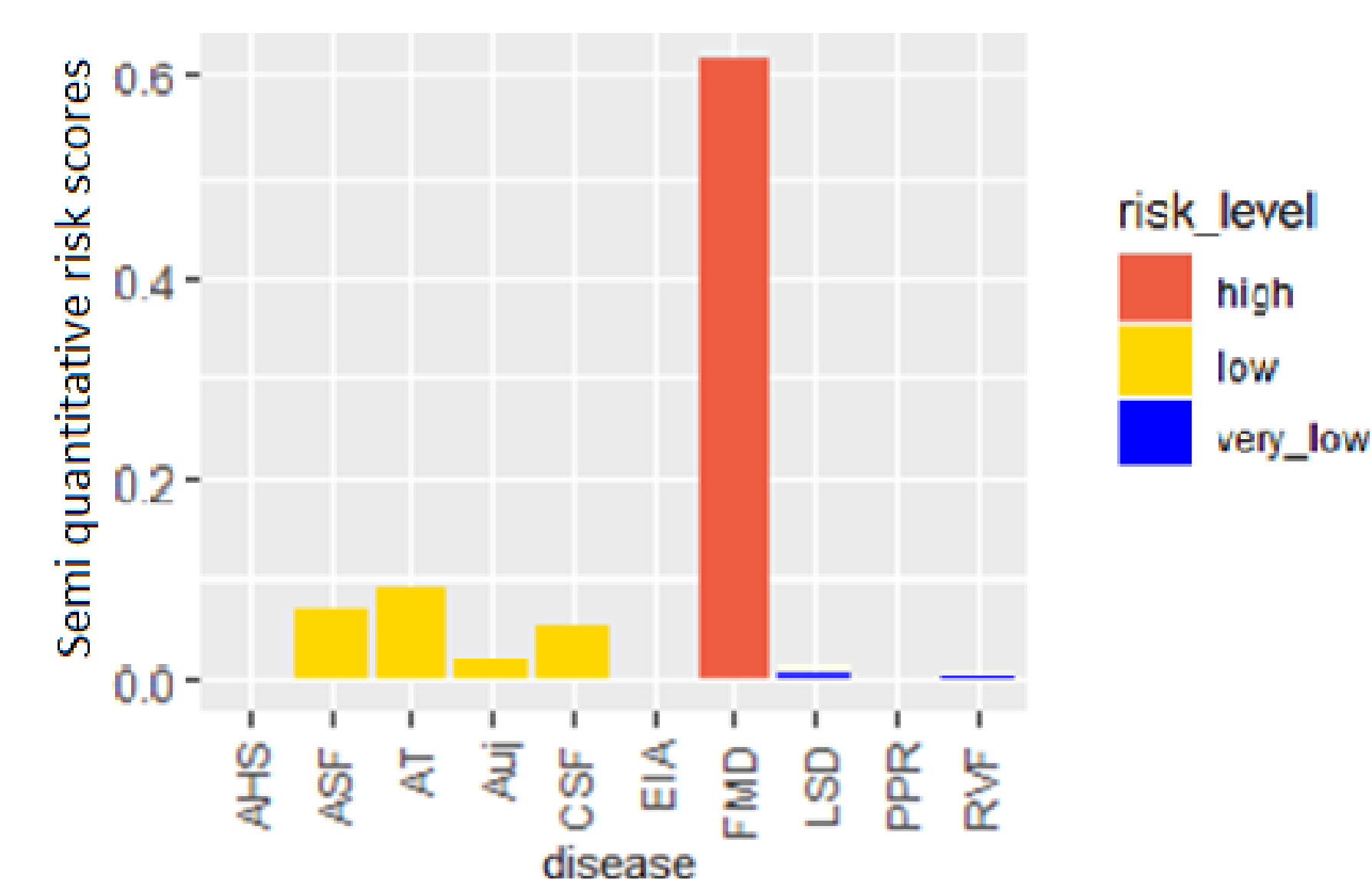
N_{CM}: Number of merchandise (M) (live animals or products) imported from a country (C) in a one-year period

- TRACES-NT data processing:
 - Classification of merchandises
 - Geolocation of flows

- World Animal Health Information System (WAHIS) data processing
→ Disease prevalence attribution based on epidemiological risk classification
- Assignment of other epidemiological parameter values based on literature and expert opinion

Results

The result are graphical rankings of overall risk scores, by disease, by route of transmission and, more specifically, by country of origin or group of merchandises.



Risk of introduction of 10 selected diseases in France through product imports (in 2022)

AHS: African horse sickness; ASF: African swine fever; AT: Aethina Tumida; Auj: Aujeszky's disease; CSF: Classical swine fever; EIA: Equine infectious anemia; FMD: Foot and mouth disease; LSD: Lumpy skin disease; PPR: Peste des petits ruminants; RVF: Rift valley fever

In 2022: high risk of introducing foot and mouth disease (FMD) mainly due to leather imports, with many trading partners whose FMD status is not always clear or reliable

INVESTIGATION OF PUBLIC HEALTH EMERGENCIES

Objective

When a country reports an animal disease outbreak, trading partners assess whether potentially contaminated animals or animal products/by-products have been imported during a risk period

Methodology

- Identification of mouvements at risk in the TRACES-NT database, for a given disease, on the basis of published epidemiological knowledge*

*pre-parametrization for the 10 diseases listed in the other functionality, custom settings possible

Usage

Inputs:

- Period and trade route to investigate
- Disease / Species or products

Outputs:

- Table with all identified movements
- Visual representations



Example of a flow map based on simulated data. The red dot indicates the location of the disease-infected case and black lines the trade movements between the infected country and France.

Usefulness

- Robust support for comprehensive risk assessment
- Increase stakeholders awareness
- Help competent authority to take relevant preventive actions
- Already used by the French epidemic intelligence team of the Animal Health Epidemiological Surveillance platform and the French Ministry of Agriculture

Limits / Perspectives

- UTOPIA requires access to TRACES-NT
- Only takes into account legal commercial routes
- Sensitivity analyses underway to quantify the impact of parameter values, particularly those defined by expert opinion
- Inclusion of illegal data and wildlife movements to be made
- Easily adaptable to other diseases or to non-French European situations

Reference

1. De Vos et al., 2022. Rapid risk assessment tool (RRAT) to prioritize emerging and re-emerging livestock diseases for risk management. Front. Vet. Sci.

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