

Epi-Flu: Contingency Tools for Avian Influenza in Cattle

Cattle Seminar: 30th Jan, Copenhagen

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Mælkeafgiftsfonden **Kvæg**afgiftsfonden

UNIVERSITY OF COPENHAGEN



Overview



Background



Outline

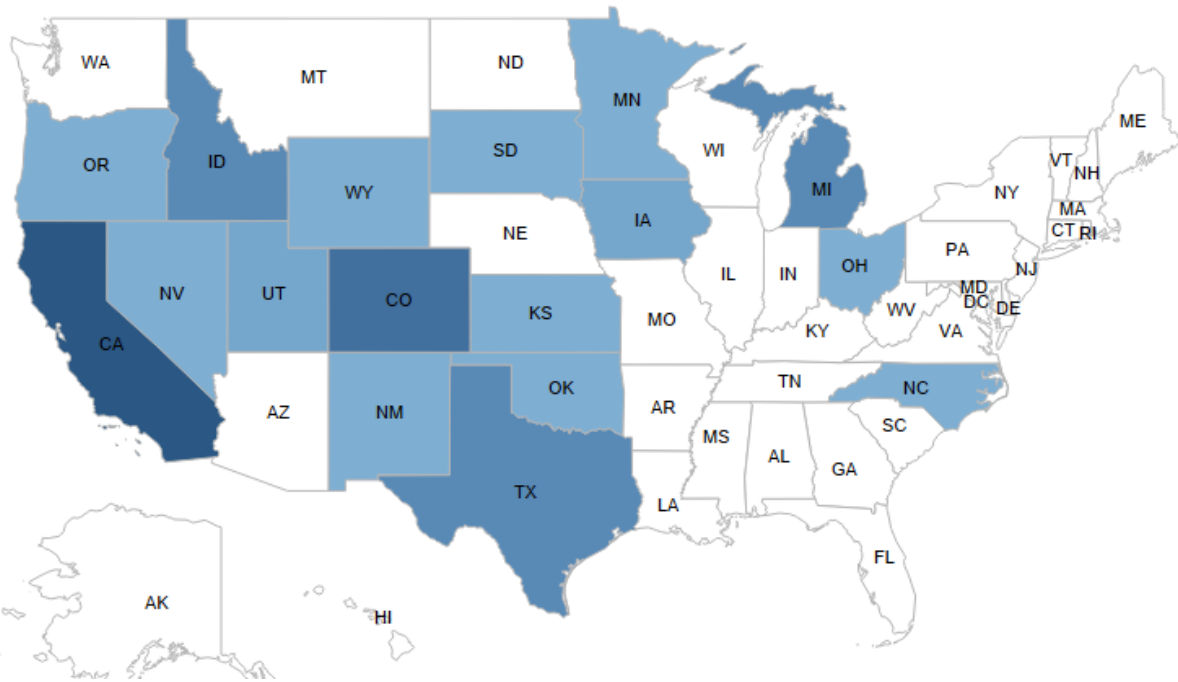


Impact

One Wild Bird Spillover to Over 900 Herds Across 17 States in 9 Months

In the Total Outbreak, in Livestock (all), there were:
939 Confirmed Cases in 17 States

Number of Confirmed Cases in Livestock (all) by State, Total Outbreak



(Source: USDA, 2025)

MAY 9, 2024 | 6 MIN READ

How Bird Flu Caught the Dairy Industry Off Guard

Understanding how avian influenza jumped into cows can help shape the path to stopping the virus's spread

BY MEGHAN BARTELS

NEWS | 08 May 2024

Bird flu in US cows: where will it end?

Scientists worry that the H5N1 strain of avian influenza will become endemic in cattle, which would aid its spread in people.

American cows now have bird flu, too - but it's time for planning, not panic

Devi Sridhar



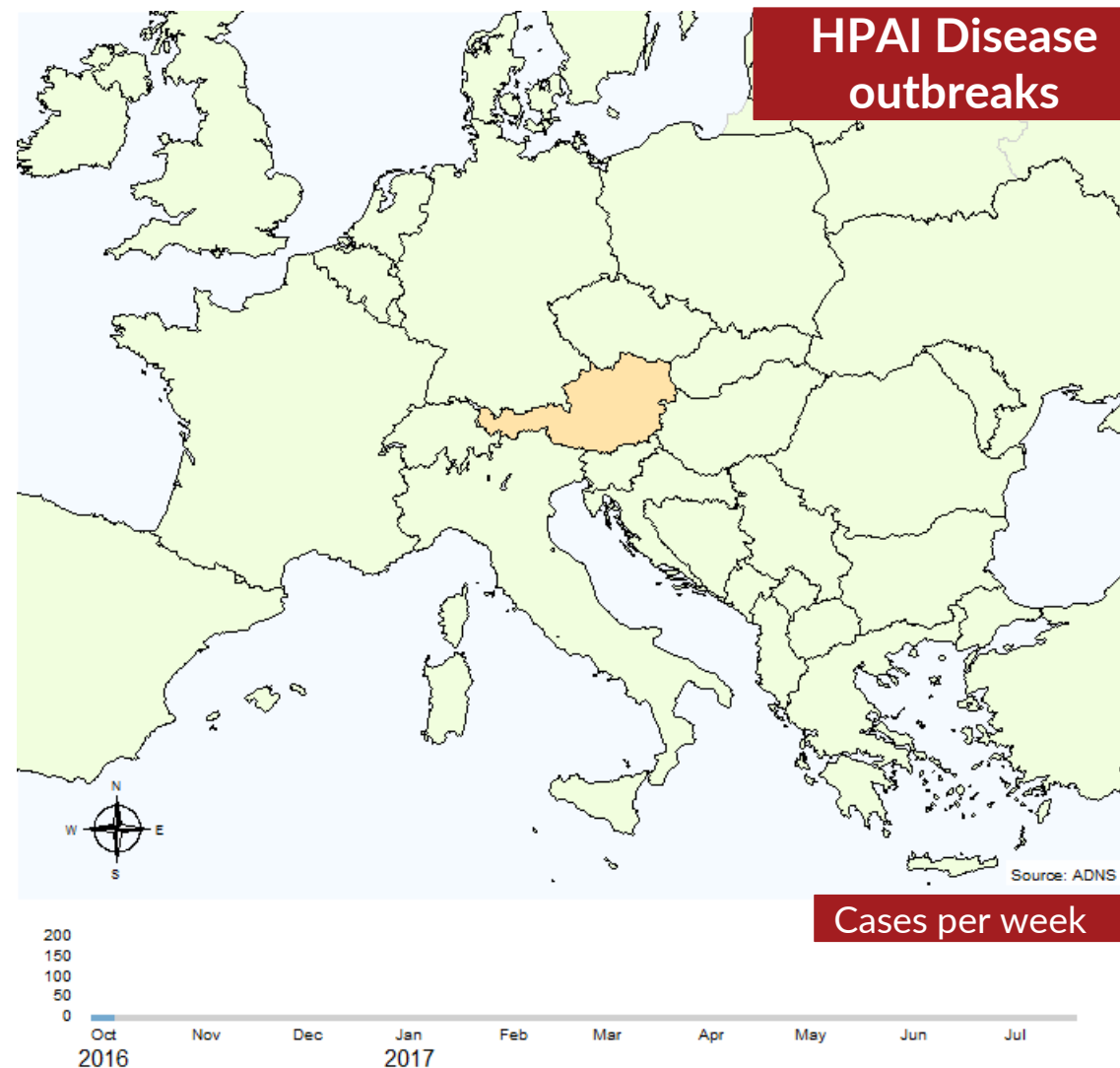
Danish Cattle Farmers Should Be Concerned, Despite U.S. Distance

- Infectious Wild Birds in the EU
- High mutation rate
- More adapted strain
- Migratory routes of birds
- Similar Transmission pathways
- Large livestock production

14.90 million livestock in 33,329 farms

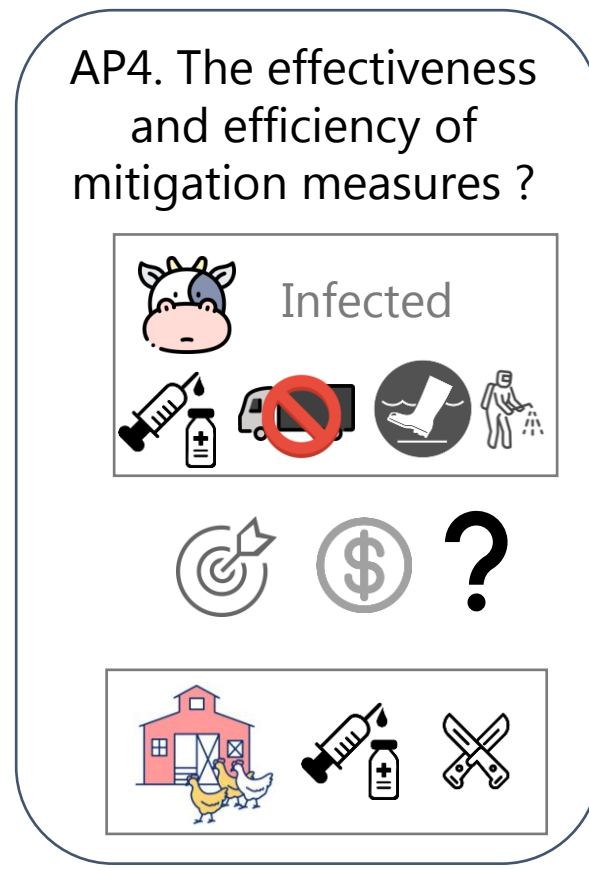
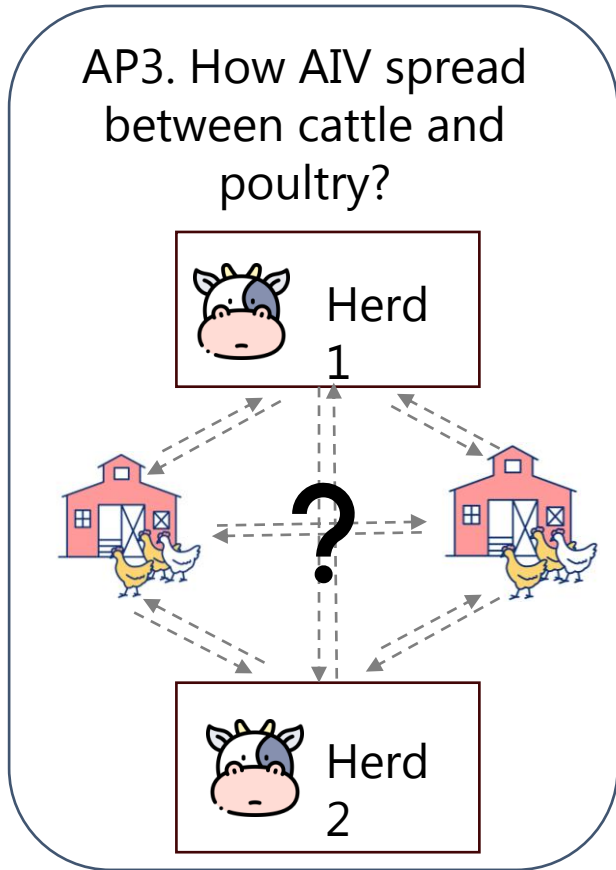
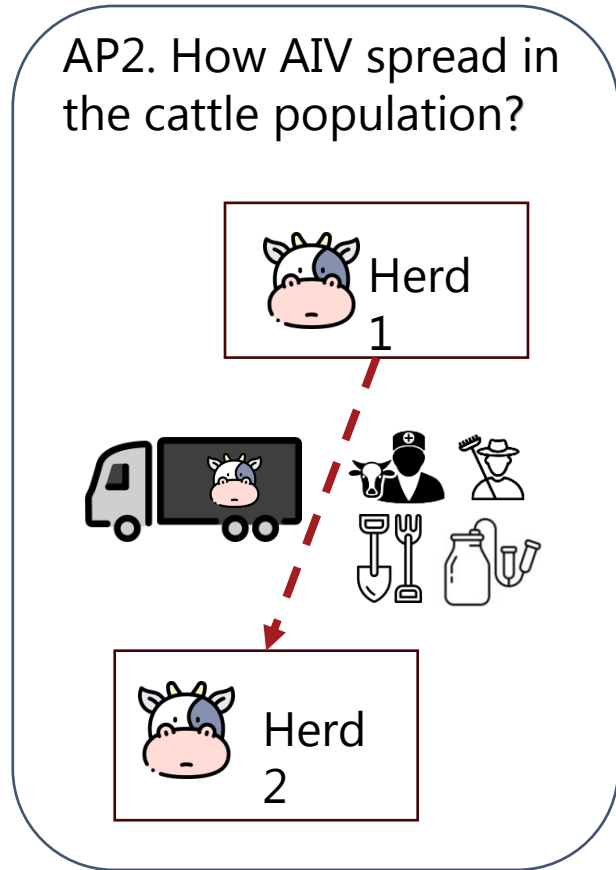
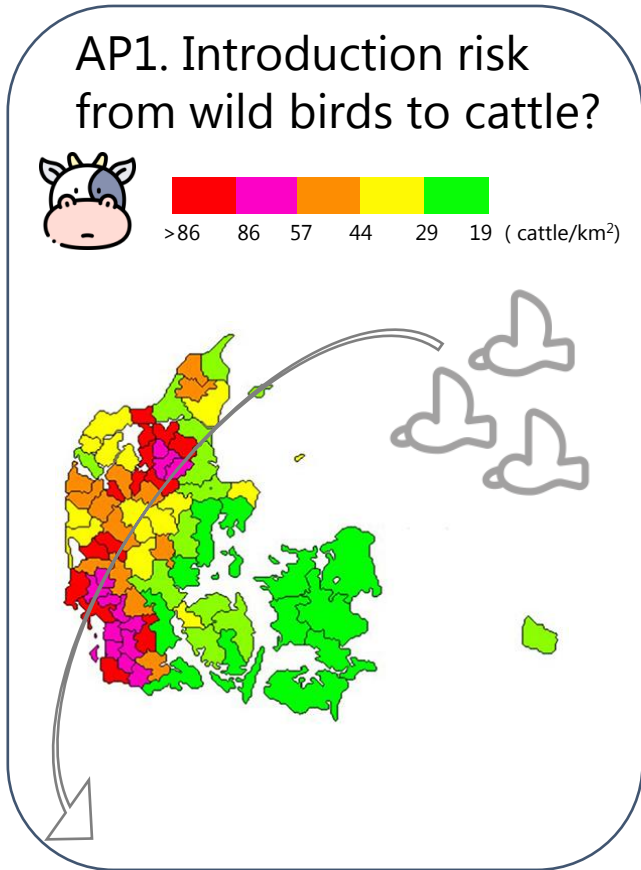
- Trade losses: 56 Mio DKK/day

(Source: Conrady et al., 2023)



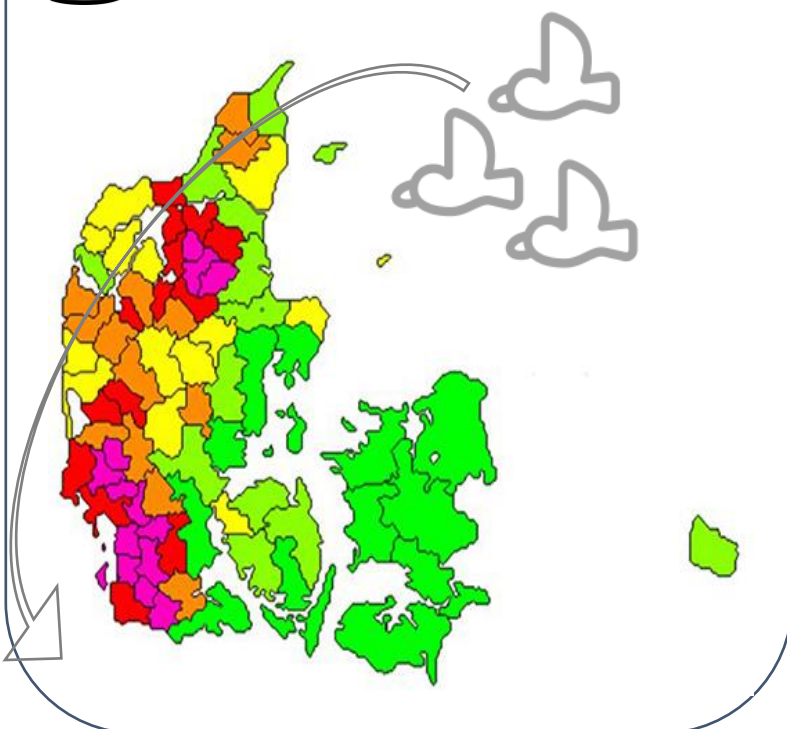
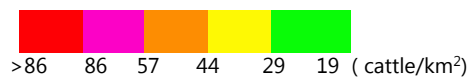
Source: Fuchs & Conrady, 2018

Epi-Flu: Safeguarding the Danish Cattle Industry from AIV



AP1: Swiftly Detect the 'First Case' with Our Advanced Risk Maps

AP1. Introduction risk from wild birds to cattle ?

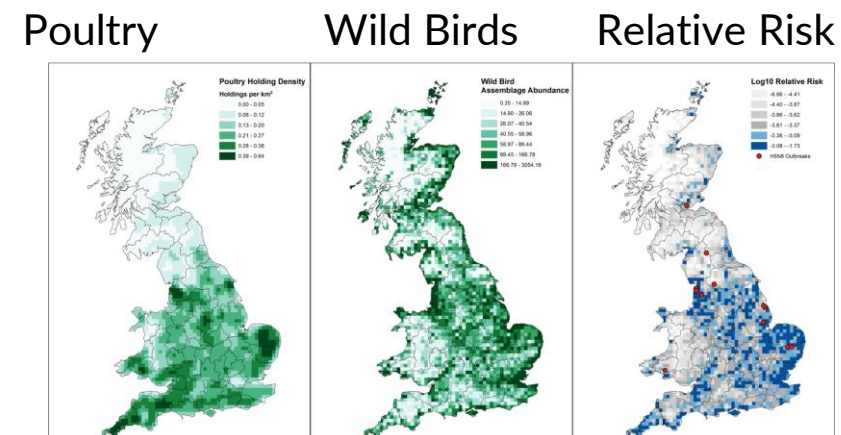


How:

Calculate the relative spillover risk

- Cattle & Farm density
- Herd type
- Wild bird abundance (migration)
- Wild bird surveillance data (Data source: EFAS Bird Flu Radar)

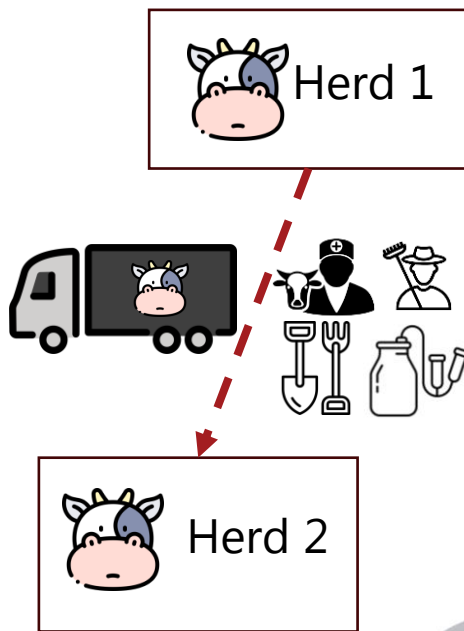
A similar study has been done in the UK



(Source: Hill, et al. 2019)

AP2: Identifying Key Areas in Denmark for Enhanced Control

AP2. How AIV spread in the cattle population?



Each farm is different

- Herd size
- Geographical area (cattle & farm density)
- Movement patterns
- Indirect contacts**

Prediction on areas of infection and size of outbreak

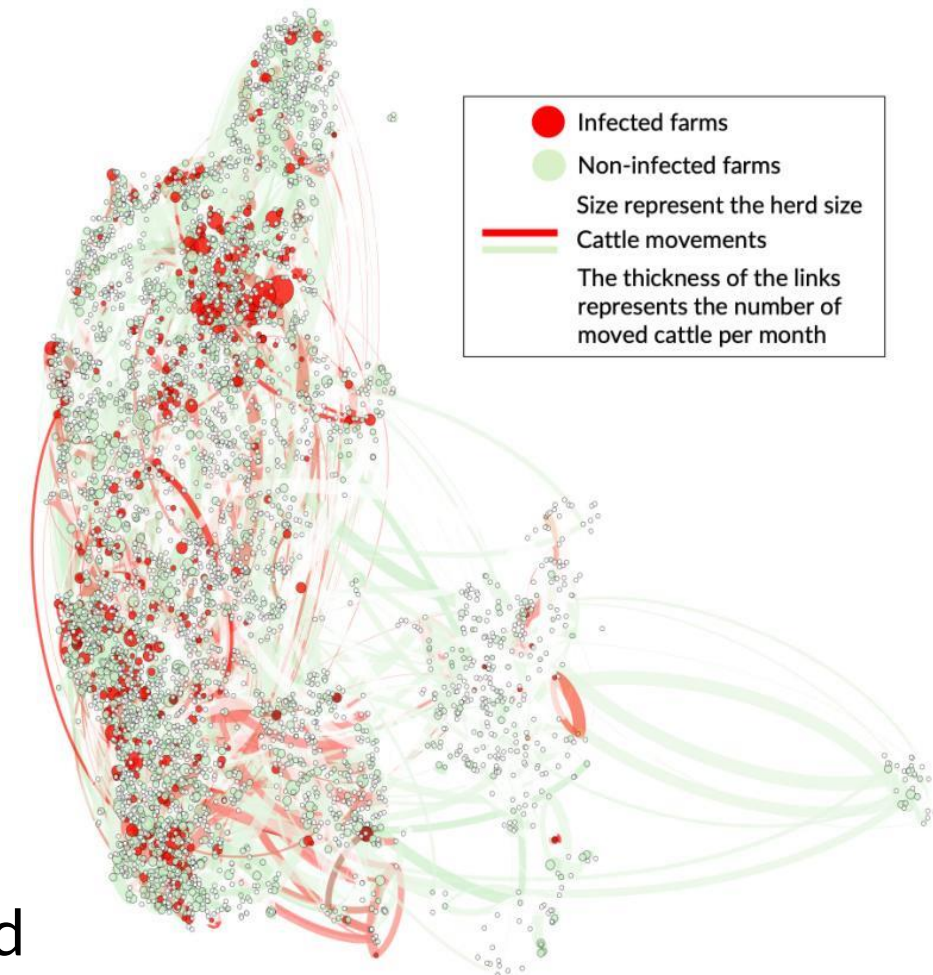
For each cattle farm

- Risk of spreading
- Risk of becoming infected

How: SimInf package

(Source: Chang & Widgren et al., 2024)

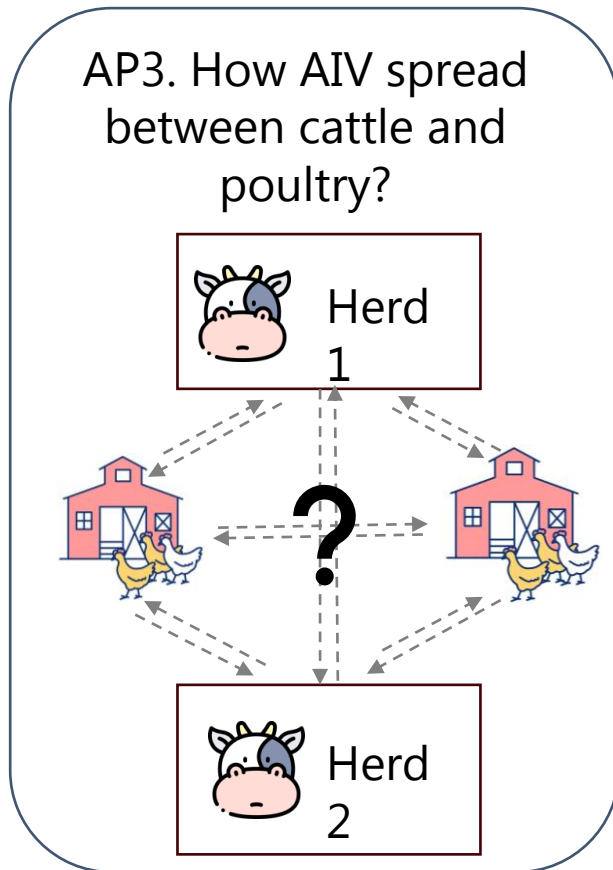
1 month of cattle traffic



Source: Conrady et al. (2024)

** Source: Fernter, Conrady et al., (2025, accepted)

AP3: Disease dynamics will change with multi-species transmission



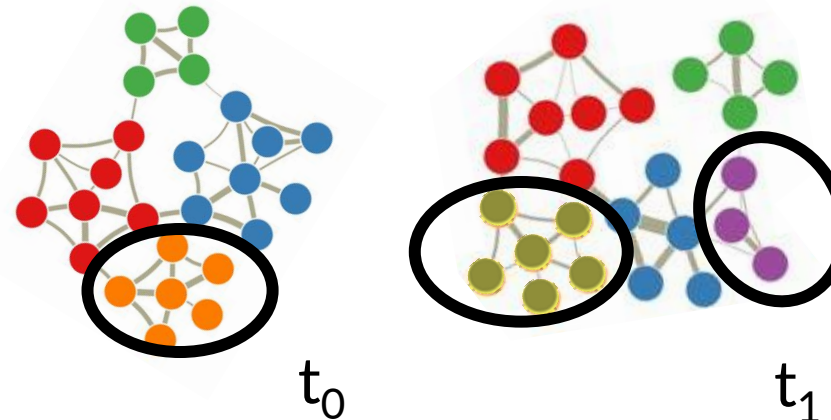
For example: Between poultry and cattle

13% of the Danish livestock farmers keep more than 1 species

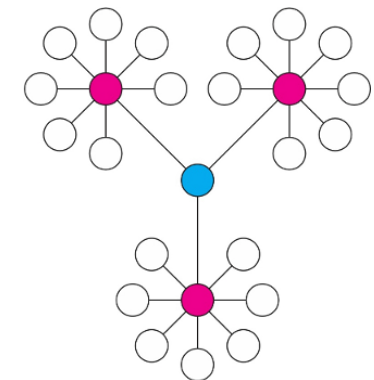
How

- **Network analysis:** how important are individual farms in a multi-species transmission
- **Risk maps:** spreading and becoming infected

Movement Cluster



Network properties



Source: Conrady et al. (2024)

AP4: Provide insights into cost-effectiveness of various control measures

AP4. The effectiveness and efficiency of mitigation measures?



How

- Introduce **control mechanisms** to the models developed in AP1-3
- Evaluate the **effectiveness** of potential control strategies
- Estimate the **costs** associated with each strategy
- Compare **cost-effectiveness** across strategies

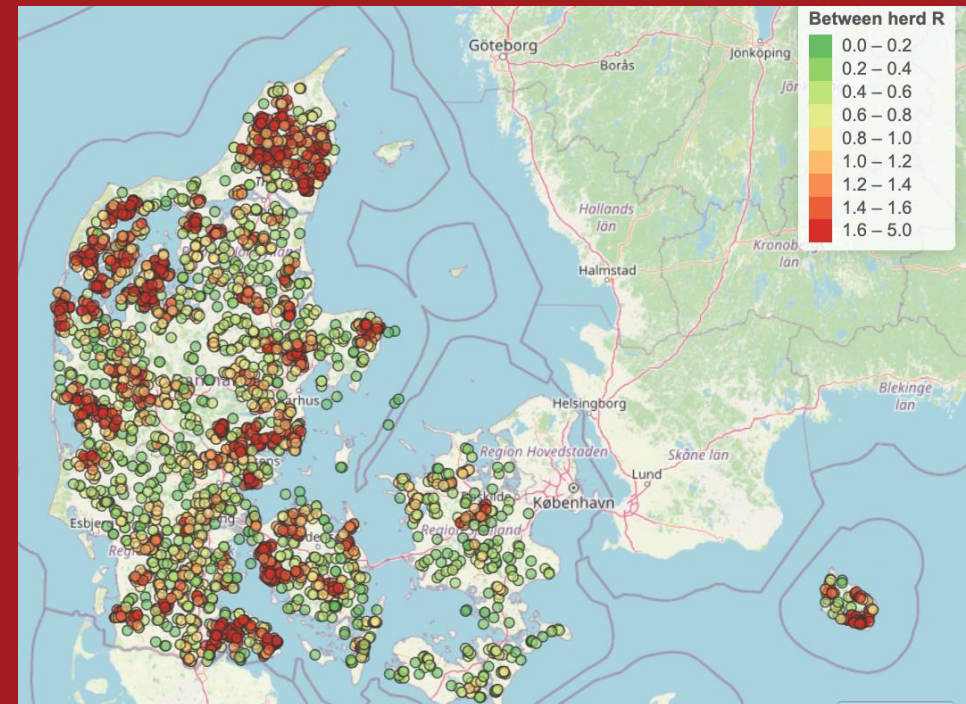
AP5: Interactive Dashboard and Knowledge Dissemination

- **Tool:** An interactive data panel to illustrate the results
- **Users:** Farmers, vets, risk assessors, outbreak managers
- **Availability:** SEGES' website and possibly in DLBR-DMS
- **Dissemination:**
 - Conferences
 - Workshops
 - National media
 - Scientific journals



IMPACT OF THE PROJECT

- Fast & effective response to AIV
 - Risk maps for introduction and transmission
 - Cost-effectiveness
- Protect farmers and industry
- Ensure the resilience of the Danish cattle sector against future outbreaks



A hypothetical risk map



Mælkeafgiftsfonden

Kvægafgiftsfonden

Epi-flu Project Partners



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Questions ?