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Resource development to maximise effective control of an outbreak of African Horse Sickness in Great Britain

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Background and relevance to the Thoroughbred (1)

- Insect vector-borne infectious diseases should be considered emerging threats to all horses in the UK, irrespective of their size, breed or use.

- Examples of such diseases include:
  - **African Horse Sickness (AHS) spread by biting midges**
  - Equine Infectious Anaemia (EIA) spread by biting flies
  - West Nile Virus (WNV) spread by mosquitoes
  - Piroplasmosis spread by ticks

Background and relevance to the Thoroughbred (2)

- An occurrence of AHS in the UK would be likely to have an immediate, widespread and prolonged impact on almost all horse related activities.

- Government and the equine industry in the UK have worked together to develop legislation and contingency plans to help deal with AHS.

- This project considers further measures to maximise effective control of an AHS outbreak in the UK.

Reasons for this study

- Assess usefulness of National Equine Database (NED) owner data to map the national horse distribution of Great Britain.
- Assess extents of data missing from NED and obsolete data retained in NED.
- Develop mathematical models of the risk of outbreaks of African Horse Sickness (AHS) occurring in Great Britain.

What we did (1)

- Assess the separation of owner location and horse locations to **create new GB-wide horse population map**.

- Assess Trading Standards inspections data to find **percentage of GB horse population with missing passports**.

What we did (2)

- Survey of owners with PIO-registered horses to find the **percentage of NED population with obsolete records**

- Use existing and new data to **model risk of AHS outbreaks in GB** and assess factors that cause variation in risk to all horses, irrespective of size, breed and use

Results (1)

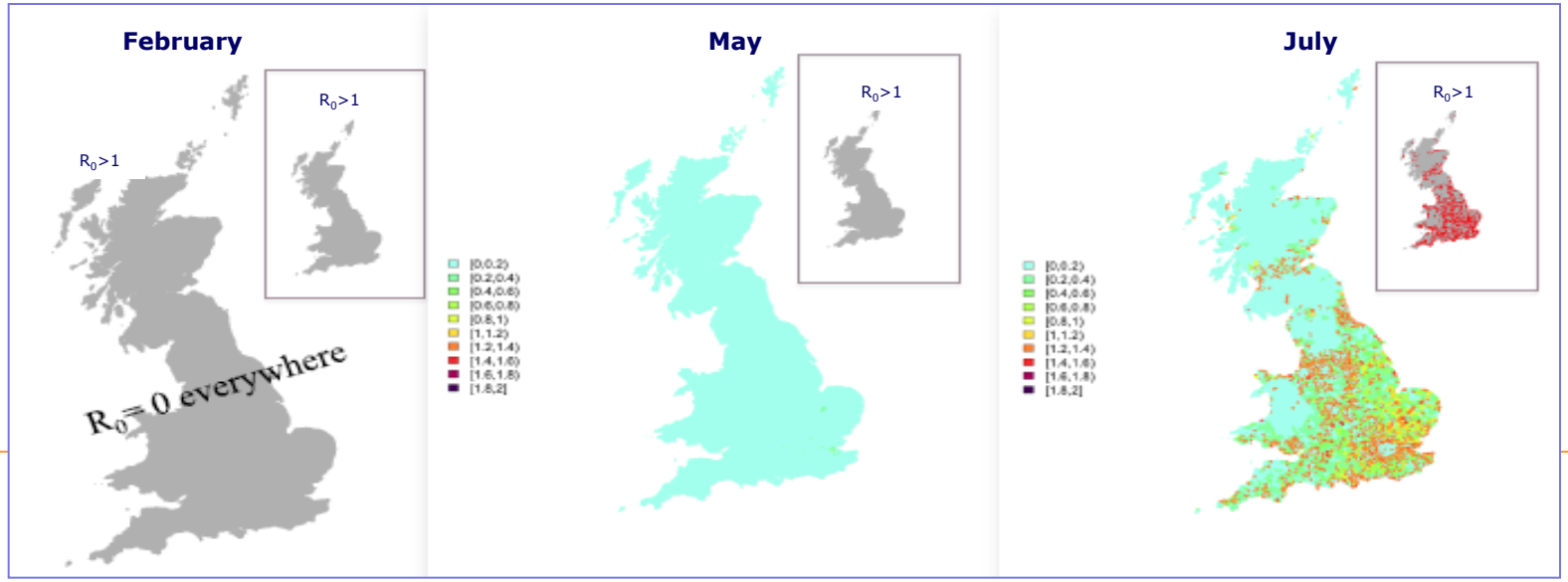
- Estimates made of inaccuracies in NED:
  - **3.5% of live horses in GB missing** from NED
  - **11.7% of deceased horses retained** in NED
  - Horse population **over-estimated** by NED
  - National population estimated at **1.1M horses**

Results (2)

- Revised GB horse distribution modeled from NED owner locations, horse-owner separations and land usage data created:
  - **A resource suitable for disease risk modeling**
  - **Disease risk modeling uses a measure called R_0**
- R_0 = average number of new cases arising from each case of disease in a susceptible population
  - **When R_0< (less than)1 the disease cannot be maintained and dies out**
  - **When R_0> (more than)1 the disease spreads in the population**

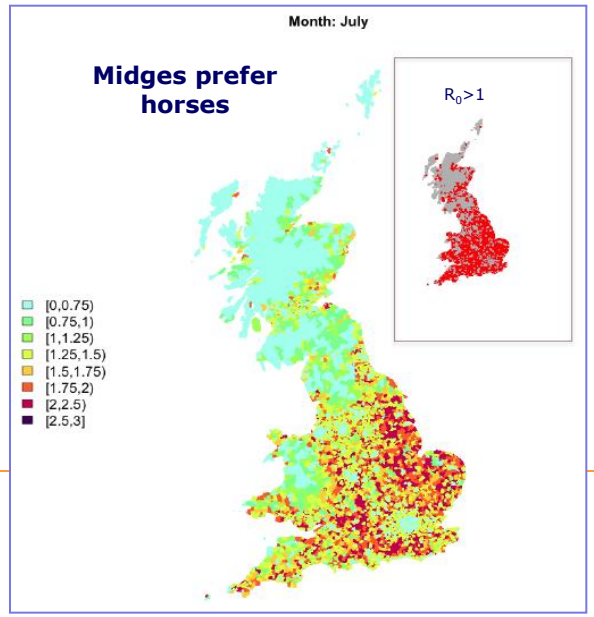
Results (3)

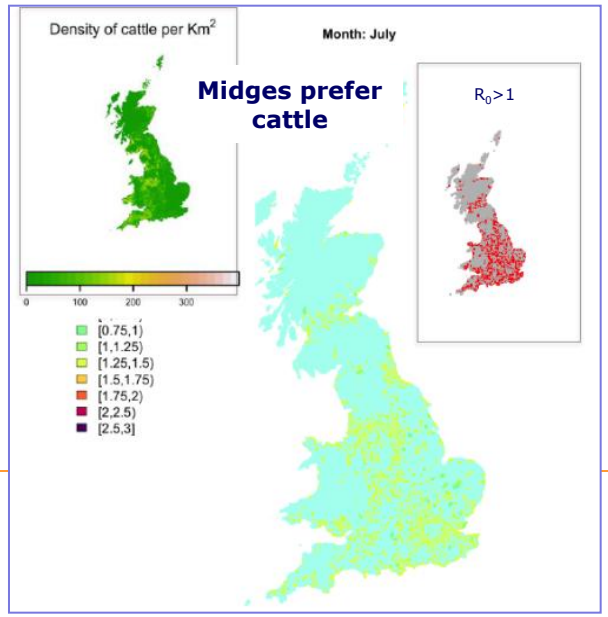
- AHS risk maps produced for GB show:
  - Risk (R_0) varies by month with temperature
    - Risk (R_0>1) of outbreaks spreading is in June to September
    - Feb: R_0=0, no spread anywhere in GB, AHS dies out
    - May: R_0<1, extremely limited spread anywhere in GB, dies out
    - July: R_0>1, spread of AHS possible in GB



Results (4)

- Risk (R_0) varies with density of ruminant species (cattle, sheep)
- Risk (R_0) varies with midge abundance
- Risk (R_0) varies with midge biting preference
  - Midges prefer horses: $R_0>1$, risk of spread AHS increased in GB
  - Midges prefer cattle: $R_0\geq1$, some limited spread of AHS in GB, co-grazing cattle with will probably protect horses





Conclusions & relevance to the Thoroughbred (1)

- The project identified the need for better:
  - Compliance by horse owners with passport regulations for NED data to be more useful for disease control purposes.
  - Knowledge of midge feeding preferences to better understand effect on AHS of co-grazing ruminants.

Conclusions & relevance to the Thoroughbred (2)

- Knowledge of how midge abundance relates to the amount of available hosts.
- Surveillance for AHS in warmer months when outbreaks would be at greatest risk of spread.
- Knowledge of methods to optimise vaccine coverage in Eastern and Southern England to eliminate AHS.

Scientist's Summary

- African Horse Sickness (AHS) is a highly fatal, biting-midge insect-borne viral disease of horses, currently restricted to sub-Saharan Africa.

- Control of emerging diseases like AHS requires knowledge of horse population size and geographical distribution and mechanism of spread.

- Data on the UK equine population held on the National Equine Database (NED) needed investigating to determine how useful NED was as a resource for assisting equine disease surveillance and control.

Scientist's Summary

- This project examined the extent of inaccuracies within NED and initiated development of mathematical models for the transmission of AHS in Britain.

- Inaccuracies found in NED data, including missing and retained obsolete data, and absence of horse location information on NED, would significantly affect ability to rapidly locate horses in a major disease outbreak.

- To overcome this problem a more accurate national horse distribution map was created and used in developing mathematical models of AHS transmission and predict risks of an outbreak in Britain.

Scientist's Summary

- Models confirmed increased risk of AHS outbreaks June-September, but risk varying geographically with temperature, and abundance of midges and cattle/sheep (alternative hosts for midges).

- Assuming midges prefer feeding on ruminants than horses, co-grazing cattle/sheep with horses would probably reduce the risk of an AHS outbreak.

- Highest levels of AHS vaccine coverage would be required in eastern and southern England to ensure elimination of AHS.