POLICY BRIEF: Consistency of measures to identify key premises for disease outbreaks in Scottish cattle movement networks

Author: Theo Pepler, Rowland Kao
Reviewers: May Fujiwara, Amy Jennings, Lisa Boden, Harriet Auty
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1. KEY MESSAGE

To prepare for infectious animal disease outbreaks, it is useful to know which premises play key roles in disease spread. Risk of disease spread varies considerably throughout the year. Therefore, annualised measures of risk should not be used. Instead, "key premises" for disease spread at any particular time of year (e.g. autumn) are likely to be the same premises that were key premises at the same time (autumn) in previous years.

2. MAJOR FINDINGS

To identify key premises in disease spread through animal movements, two measures appear promising:
1) Risk of initiating an outbreak involving 5 secondary premises within 28 days;
2) Number of times a premises was involved in disease spread by having infected animals on it at any time ("conduit premises").

These two measures were highly variable within calendar years, but reasonably consistent for the same period (e.g. autumn) in different years.

3. OBJECTIVES

The work evaluated the consistency of six measures in identifying key premises for disease spread in the Scottish cattle movement network. The six measures were calculated from disease spread simulation models.

4. POLICY IMPLICATIONS

For most premises, disease spread risk through animal movements is highly variable throughout the year (assumed to be related to trading patterns and production type). Therefore, annual risk estimates for individual premises would be inaccurate to use to target farms for surveillance and control purposes. Identification of cattle premises most at risk of initiating medium to large disease outbreaks should be carried out dependent on the time of year (seasons), and risks from the same time in previous years can be used to estimate future seasonal risks.

"Conduit" premises (those that were more frequently involved in outbreaks) could be prioritised for disease surveillance efforts. Farms with the greatest epidemic risk (leading to outbreaks of more than 5 farms) could be prioritised for movement controls (such as standstill periods).

5. IMPORTANT ASSUMPTIONS AND LIMITATIONS

Infectious disease spread was simulated on the observed Scottish cattle movement network (years 2012 and 2013).

It was assumed that:
- There was **homogeneous mixing** of animals at each premises;
- **Animals were selected randomly for movement**, rather than being moved as batches that were likely to have been managed as groups on farm;
- Recorded **livestock movements represent the only mode of transmission** between premises (i.e. no environmental contamination, spatial spread, or disease vectors);
- **Premises were not carrying out any disease control measures** such as quarantine or other biosecurity measures.

The simulations were for a **highly transmissable, fast spreading disease**. Results may not generalise to slower, less transmissable diseases (for example, bovine TB). Also, the simulations were performed **only for the cattle network**. Results for other networks, and multiple species contact networks may differ.

6. LINKS TO EXISTING PUBLICATIONS OR REPORTS

EPIC Report: *The Consistency of Measures to Identify Key Premises for Disease Outbreaks in a Scottish Cattle Movement Network*.