"Will past disease outbreaks in my area tell me about my farm's risk for the next one?"

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Key point

There is a predictable pattern of occurrence of PRRS cases in time and space that can be used to assess the current risk of breaking.

What is our ultimate goal?

To use the years of data gathered by the Swine Health Monitoring Project (SHMP) to detect and predict time and geographical location trends in PRRS outbreaks. (i.e. optimize the use of SHMP data for long-term benefits).

Our approach

I am studying a subset of Midwestern- SHMP participants to define the temporal and geographical patterns of PRRS outbreaks in the Midwest. I am including data from 358 sow farms from 10 management systems participating in the SHMP program from between January 2011 and December 2015. The data regarding the management system, farm location, farm characteristics such as the type of farm, herd size, and the PRRS status of the farm were available from the SHMP data base. I used a linear mixed effect regression model, exponentially weighted moving average (EWMA) analysis, and scan test for space-time clusters (space-time permutation modelling approach) on this subset of SHMP data.

Findings

- As expected, PRRS outbreaks followed a seasonal pattern that was predictable over time, with a decline in May-June period, the least number of outbreaks being reported in October, and a dramatic increase in November – December.
- The patterns in 2014 and 2015 deviated from trends based on 2011 -2013 data (Figure 1).
- Farm capacity (i.e. herd size) was not an apparent risk factor.
- Farms with air filtration were significantly less likely to suffer PRRS outbreaks compared to non-filtered farms.
- PRRS cases were seasonal and aggregated by geographical space (i.e. there were spatiotemporal clusters as also reported by Tousignant *et al.*

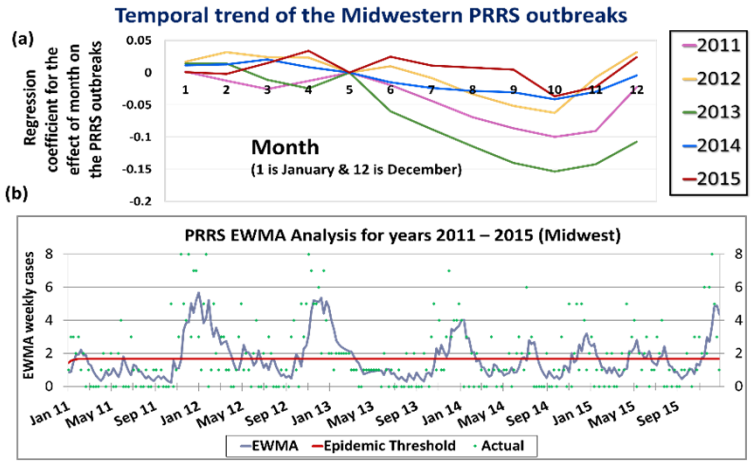

Figure 1. Temporal trend of the Porcine reproductive and respiratory syndrome (PRRS) outbreaks in selected Midwestern farms. (a) Variation of the regression parameter over the time (May was used as the reference month). (b) Results of the exponentially weighted moving average (EWMA) analysis for the five years of data (2011-2015).

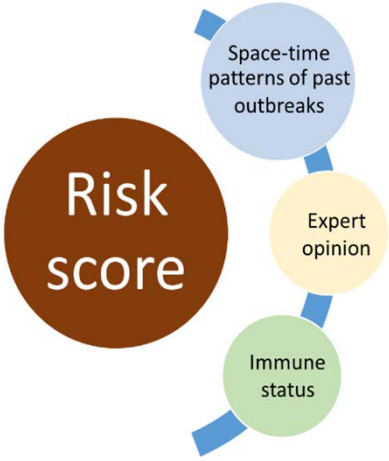

Figure 2. Generating a risk score using the space-time patterns of past outbreaks, expert opinion, and the immune status of the farm based on the vaccination records

What does it mean?

The presence of space-time clustering of cases creates the foundation for a statistical model that uses spatiotemporal trends to predict farm-level risks of breaking with PRRS. As summarized in Figure 2, we hope to further analyze the SHMP data and see whether the space-time patterns of past outbreaks along with the expert opinion and the immune status of the farm at a particular week based on the vaccine records may help us assign a risk score regarding the potential for PRRS outbreaks.

Reference: Tousignant SJP, Perez AM, Lowe JF, Yeske PE, Morrison RB. 2014. Temporal and spatial dynamics of porcine reproductive and respiratory syndrome virus infection in the United States. American Journal of Veterinary Research 76: 70-76