Comparing algorithms performance for monitoring endemic disease: a simulation study based on the Danish PRRSV monitoring program

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Comparing algorithm performance for monitoring endemic disease: a simulation study based on the Danish PRRS monitoring program.

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Introduction and objectives
- The use of statistical process control for monitoring endemic diseases has so far been unexplored.
- In this case, it is important to monitor changes of disease prevalence, which might indicate disease spread, allowing control efforts to be triggered immediately. So...

Let’s investigate the performance of univariate process control algorithms (UPCA) to detect changes in PRRS sero-prevalence and assess the effect of the sample size in their performance.

Methods

A. Time-series analysis
- Simulate increases on the weekly PRRS sero-prevalence from 0.10 to 0.15 and 0.20 based on 1, 10 and 100 times the weekly number of swine herds tested for PRRS.

B. UPCA tested
- Exponential Weighted Moving Average (EWMA)
- Cumulative sum (CUSUM)
- P Sheewart (PSHEW)

C. Performance evaluation
- Cumulative sensitivity (CumSe): cumulative % of 2000 iterations in which an alarams was raised after the increase was started.

Results

The results are represented for increases in the sero-prevalence from 0.10 to 0.20 over 24 weeks for different sample sizes and each color corresponds to an UPCA.

- PSHEW and EWMA had higher CumSe when compared with the CUSUM for the different simulated scenarios.
- Increasing the sample size 10x halved the time to detection (CumSe=1), whereas 100x reduced the time to detection by a factor of 6.

Conclusions
- Small changes in diseases sero-prevalence can be detected by using these algorithms.
- Increasing the sample size provides a faster detection for PRRS.

Perspective
- Set up a surveillance and monitoring system in Denmark based on laboratory data.

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