We thought it would be interesting to review and remind you how the Exponential Weighted Moving Average chart is calculated.

PRRS EWMA analysis for years 2009 - 2018
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Key Points:
  - **The EWMA chart is a smoothed chart of the percentage of farms that are breaking.**
  - **Newly added farms to MSHMP increase the denominator therefore diluting the estimate which affects the EWMA chart giving the impression that   PRRS season has changed.**

The Exponential Weighted Moving Average (EWMA) charts are weighted control charts which are suited for tracking processes that exhibit a drifting mean over time or for noticing small changes in a process, such as the number of cases per week. The exponential smoothing is a type of analysis of longitudinal data (time series analysis) used in signal processing to indicate an "event" when the line crosses a specific threshold. The smoothing reduces the high frequency noise, enabling a clearer trend to be seen. Different smoothing factors can be applied to a time series data set. Choosing a smoothing value is based on experience and the desired sensitivity of the signal. This approach is used to signal the onset and the end of the flu season in humans.

MSHMP report chart 4 depicts: 1) the number of new cases (green dots – secondary Y axis) during a specific week and 2) the percentage of farms that broke during that week of the total in the MSHMP project in a smoothed way (blue line/Y axis). The red horizontal line indicates the threshold (upper confidence limit - UCL). This UCL is calculated based on the average of cases during the lowest PRRS months in the year, June, July and August and is recalculated every two years. When there are more cases than expected, the blue line crosses the threshold (red line) indicating there is an epidemic.

The formula used in the EWMA chart is the following:

$$E = \lambda \times I_t + (1 - \lambda) \times E_{t-1}$$

where E is the smoothed % of infected herds, λ the constant smoothing the curve, I the % of infected herds during that week and E_{t-1} is the smoothed % of infected herds during the previous week.
If different smoothing factors are applied to the MSHMP data this would generate different trends and then we would place the threshold based on the sensitivity that we consider that signals an epidemic (Figure 1).
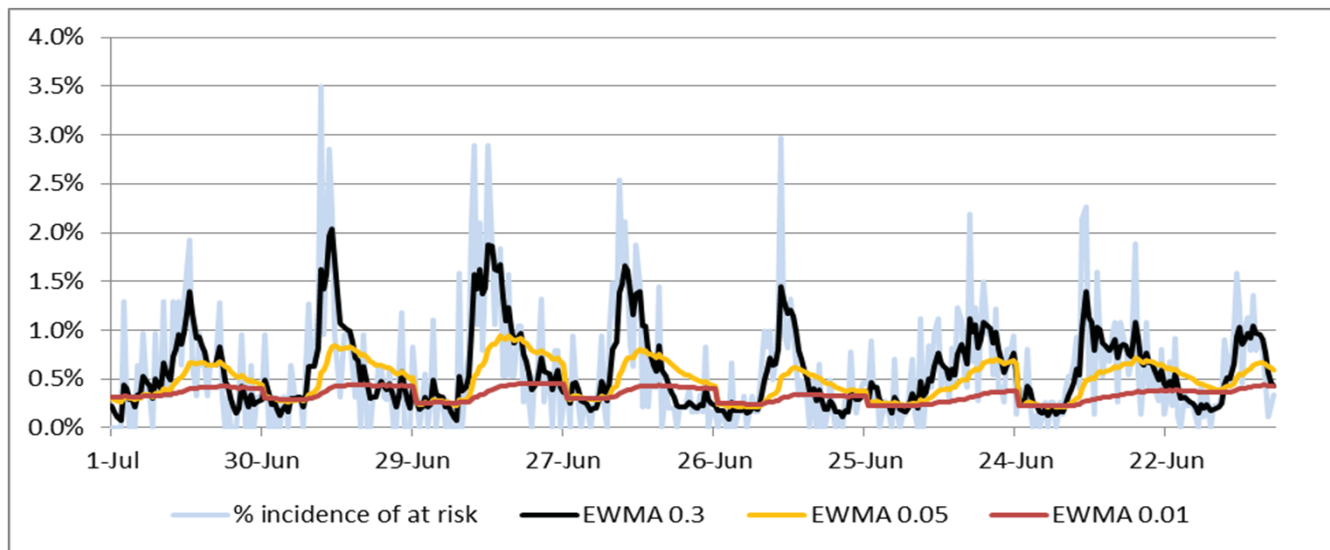
It is a recurrent question if the incidence of PRRS has changed. One possible reason the EWMA % of cases decreasing might be that the number of farms that are breaking expressed as a percentage is less. This can be due to the fact that the total number of farms sharing PRRS status has been increasing and these new farms might have a lower underlying incidence. We have almost doubled the number of farms participating in the monitoring program currently as compared to 2012. In addition to influencing the % of cases, the fact that these farms are located in different regions across the country could reflect slight differences (delay or advance) in the PRRS season and those scattered breaks could be widening the base of the PRRS seasonal peak in the EWMA % chart and suggesting that the season is longer than it was but it is an artifact of when they break.

We continue screening and analyzing the MSHMP data looking for new insights and seeking to provide you with more information related to the spread and distribution of the disease.

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