





Chart 4 PRRS EWMA Review

The MSHMP Team

Key Points:

- The EWMA chart is a smoothed chart of the percentage of farms that are breaking
- Different smoothing factors applied to the data result in different trends and upper confidence limit thresholds

The Exponential Weighted Moving Average (EWMA) is a method that averages data over time. This method is also suitable for detecting small changes in a process, for instance, this methodology is used to signal the onset and end of the human influenza season. We use EWMA in a similar way but for PRRSv 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" which refers to when the data or process has crossed 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 upon experience and the desired sensitivity of the signal.

The MSHMP report chart 4 for PRRS depicts: 1) The number of new cases in each week represented by the green dots (secondary Y-axis), 2) The smoothed percent of farms that broke during that week out of the enrolled farms (smoothed blue line Y-axis). The red horizontal line indicates the threshold or upper confidence limit (UCL). This UCL is calculated based on the weighted 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 red line threshold, indicating that there is an epidemic in progress (Figure 1).

The formula used in the EWMA chart is:

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

Where *E* is the smoothed percent of infected herds, λ is the constant smoothing curve, *I* is the percent of infected herds during that week, and E_{t-1} is the smoothed percent of infected herds during the previous week.



Chart 4 - PRRS EWMA analysis for years 2009 - 2023

Figure 1: Example of the impact of different smoothing factors on PRRS trend visuals using MSHMP 2012 to 20123 data

Thanks to practitioners and producers, the cyclical pattern of PRRS occurrence in breeding herds has been characterized for the last 15 years as it has started in the fall and ended in the spring. During 2021, this cyclical pattern was different as there was one extra epidemic during the year starting in spring-summer of 2021 as a consequence of the second wave of the emergence of L1C 144.



