


Remining

EPA Statistical Methods

40 CFR 434, Appendix B

Methods

- Baseline/Quick Trigger
  - Method 1 (current Method)
    - Fewer than 17 samples
    - 17 or more sample results
  - Method 2
- Annual (Subtle)
    - Method 1 (Current method)
    - Method 2 Wilcoxon-Mann-Whitney Test

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Disclaimer

The statistics get a bit more complicated when:

- Finding a median of data set with an even number of values (you average the central 2 values)
- There are ties in using a ranking method (you average the rank of the values)
- There is a large dataset using the ranking method (can't use the table for the critical value)

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Baseline Method 1

- 95% Confidence Interval about the Median
- This is the method currently used by DEP
- With 12 (in fact, any data set with fewer than 17) monthly baseline sample results, the quick trigger is the maximum loading value
- 17 or more samples result in the following method of identifying the trigger (L)

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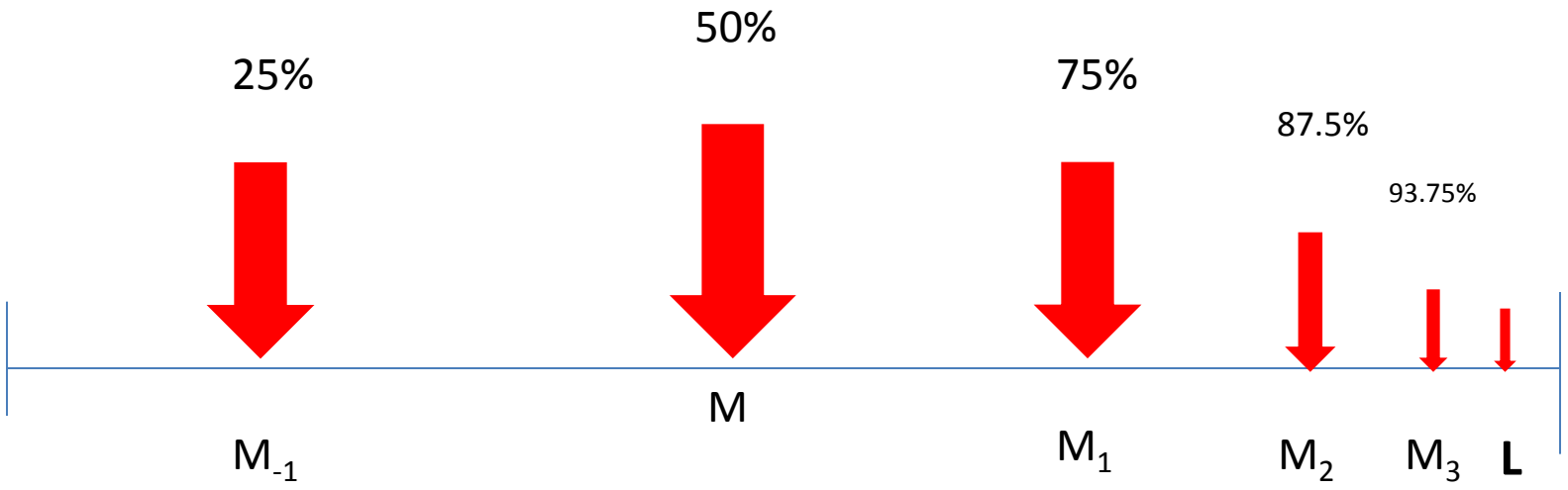
Method 1 When more than 17 baseline results are available



Quick Trigger Method 2

- Method 2 quick trigger is $M_1 + 3R$ (M is median, R is the range from M_{-1} to M_1)

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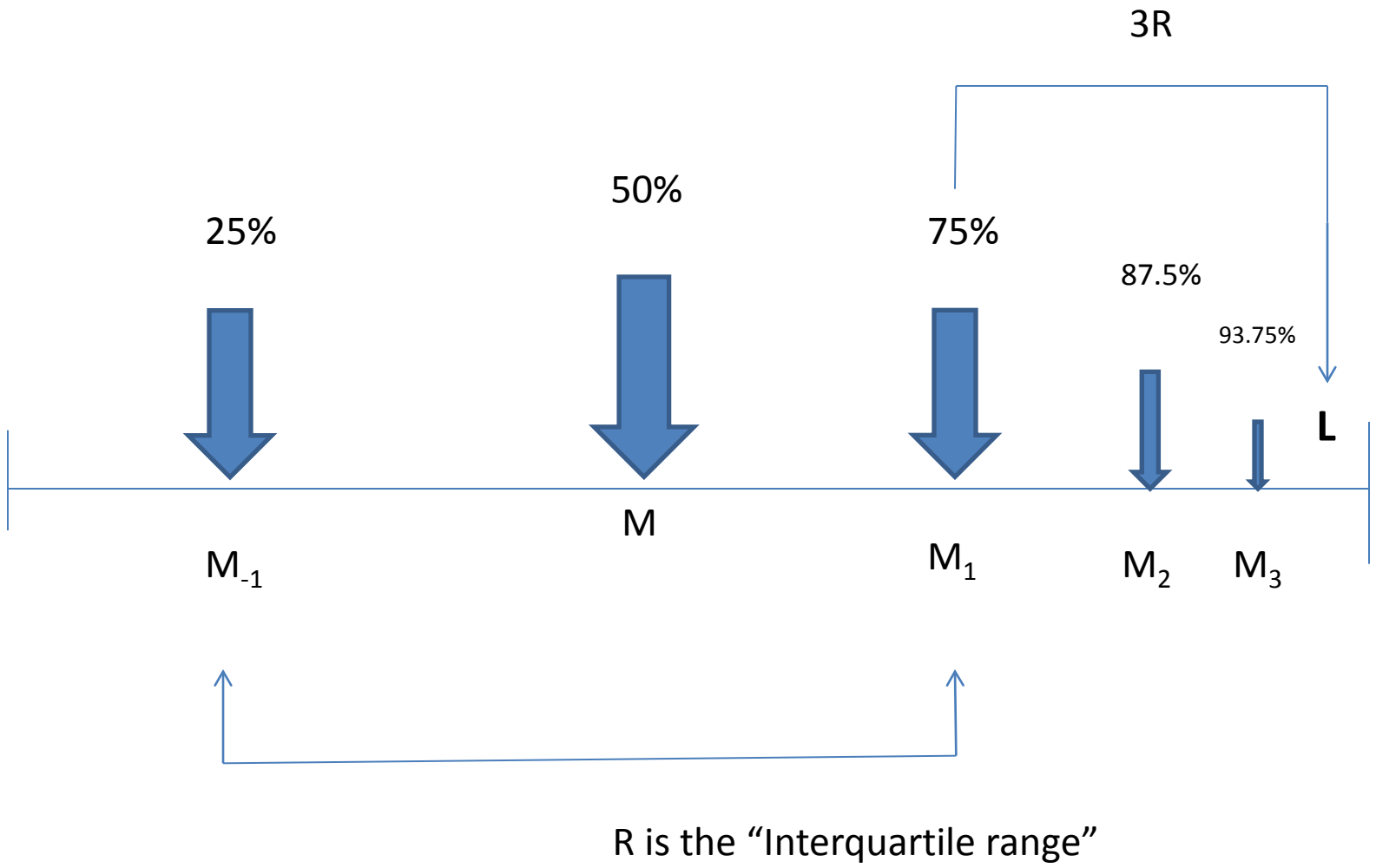
Method 2 Quick Trigger



R is the “Interquartile range”

Method 1 Annual Trigger

- Uses Median (*M* or *M'*), Interquartile Range (R) and the number of samples (n or m)
- Calculates Baseline Trigger T_b to compare with the subtle trigger T_m
- If the subtle trigger exceeds the baseline trigger then there has been a statistically significant increase in load

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Formulae

Baseline Data

$$Tb = M + \frac{(1.815 * R)}{\sqrt{n}}$$

Monitoring Data

$$Tm = M' - \frac{(1.815 * R')}{\sqrt{m}}$$

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Method 2 Subtle Trigger

- Uses the Wilcoxon-Mann-Whitney Test
- Based upon the rank of data rather than the value
- Combines the baseline and monitoring data
- Ranks them together
- Adds ranks of baseline values
- Compares this sum with Critical Value table (If the baseline sum of ranks is less than the critical value, then the monitoring has exceeded the baseline)

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Example

- Baseline 1, 3, 5, 7, 9, 11, 13, 15, 17, 19
- Monitoring 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
- Baseline sum of ranks is 100
- Critical value from the table is 66, so monitoring has not exceeded the baseline

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