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A practical method based on functional data analysis and single exponential smoothing to combine survival curves in meta-analysis: a simulation study. (English) [Zbl 1422.62305](#)

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Summary: **Aims:** The best tool to incorporate the results of trials that include time to event outcomes is the individual patient data meta-analysis which is often neither practical nor possible. Other methods are not appropriate for meta-analysis of survival data since they cannot process single-arm trials, or are limited by distributional assumptions. We proposed a method, to dispel the shortcomings and pitfalls of other approaches.

Methods: At first, we use the early steps of functional data analysis (FDA) and a correction by single exponential smoothing (SES) to combine the survival curves. Then to compare two groups, a statistic similar to the Log-Rank is proposed. A simulation study was done to investigate statistical power and Type I error. Finally, we conduct our method on a clinical data example.

Results: In increasing hazard rate, the power of test statistic increased as the sample size increased in all failures rates, but it decreased as the failure rate increases. For low failure rate, it was more than 82%. It was less than 67% in failure rate 70%. In decreasing hazard rate, the power was high and increased as the sample size increases. For the failure rate of 10%, 30%, and 50% the statistical power is more than 80%.

Discussion: The proposed method is beneficial in combining the survival curves. The results agree to employ the proposed test statistic in determining the authenticity of the difference between groups in small or moderate failure rates, and moderate or high sample sizes, in all number of studies.

MSC:

[62N05](#) Reliability and life testing

[62P10](#) Applications of statistics to biology and medical sciences; meta analysis

Keywords:

[survival analysis](#); [meta-analysis](#); [functional data analysis](#); [single exponential smoothing](#)

Software:

[fda \(R\)](#); [Stata](#); [stsurvsim](#); [SURVSIM](#)

Full Text: [DOI](#)

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