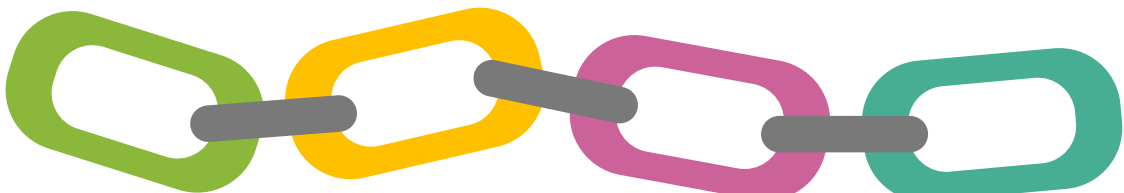






Combining Confidence Distributions for Rare Event Meta-Analysis

April 12th, 2018

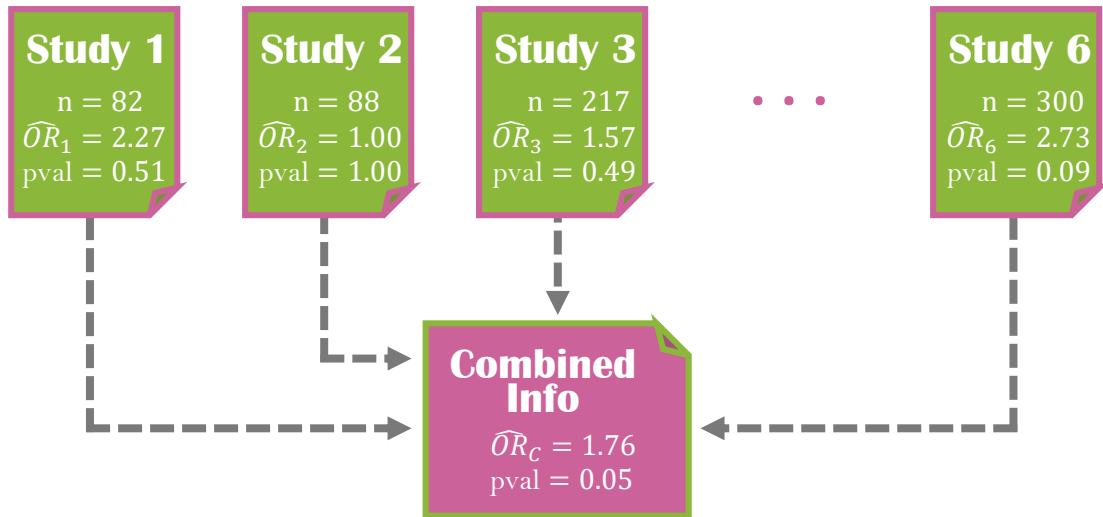
Brinley Zabriskie, Statistics PhD Student
Department of Mathematics and Statistics, Utah State University

Overview

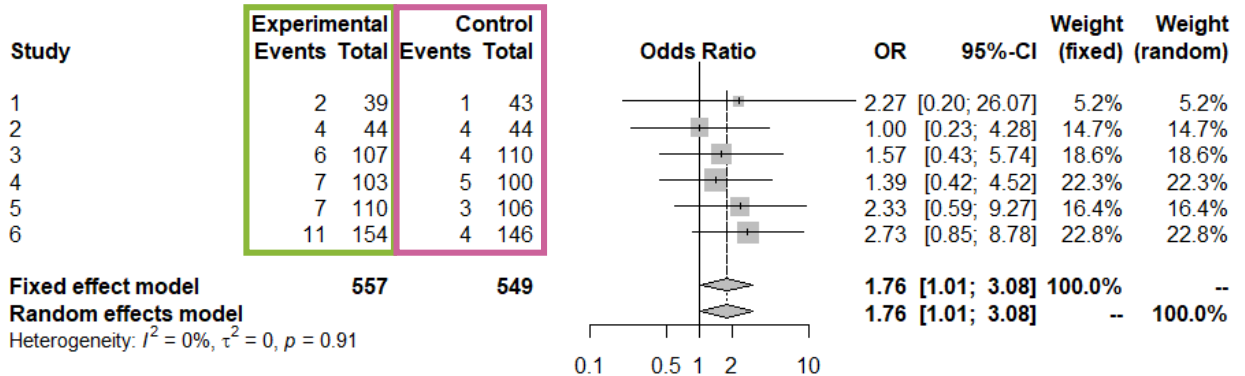


- 
What Is a Meta-Analysis?
- 
What Is a Confidence Distribution?
- 
Confidence Distributions in Meta-Analysis
- 
Improvements

What Is a Meta-Analysis?



What Is a Meta-Analysis?



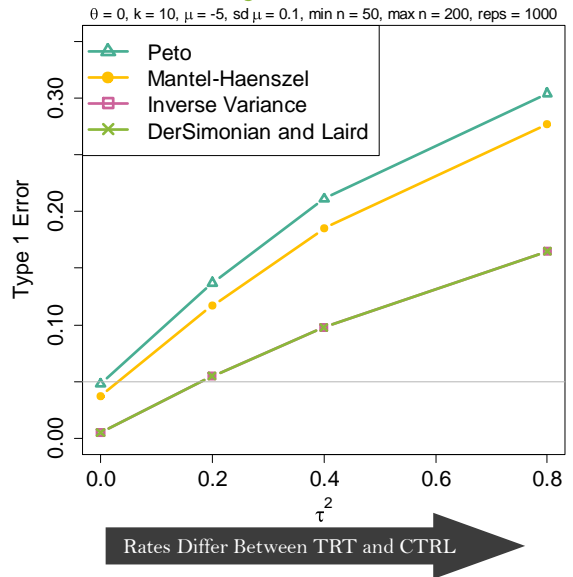
Average Treatment Event Rate: 6.6%

Average Control Event Rate: 3.8%

What Is a Meta-Analysis?

Rare Events
(baseline probability: 0.7%)

Can we lower the Type I Error rate by using methods better suited for meta-analyses with rare events?



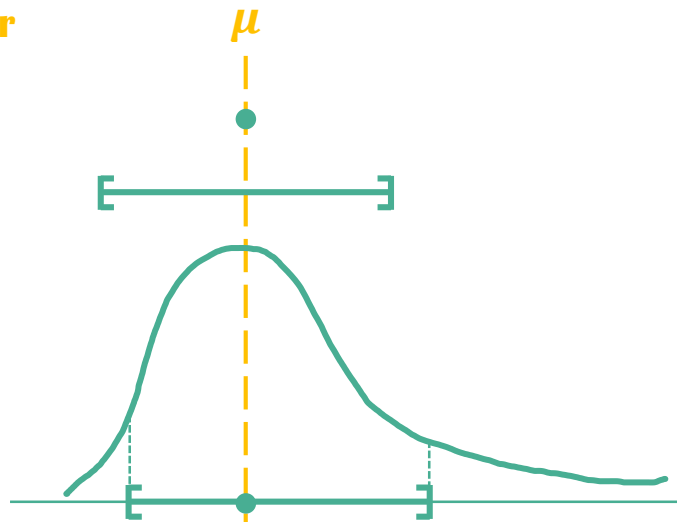
What Is a Confidence Distribution?

Population Parameter

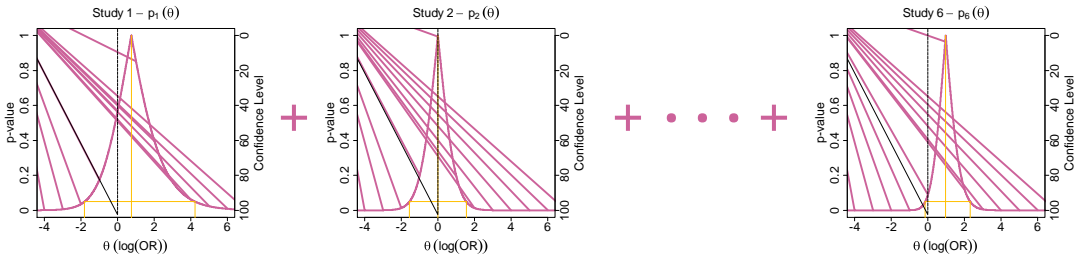
Point estimate

Interval estimate

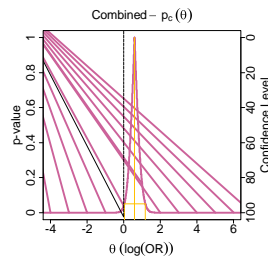
Distribution estimate



Confidence Distributions in Meta-Analysis

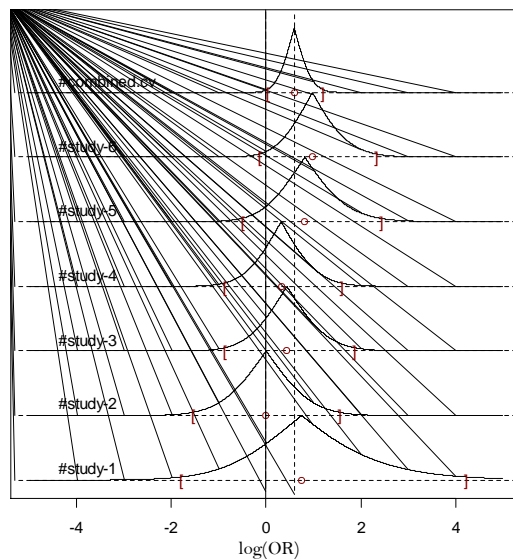


$$p_c(\theta) = F(c)[w_1h(p_1(\theta)) + \dots + w_6h(p_6(\theta))]$$



Singh et al. (2005),
Tian et al. (2009), and
Liu et. al (2014)

Confidence Distributions in Meta-Analysis



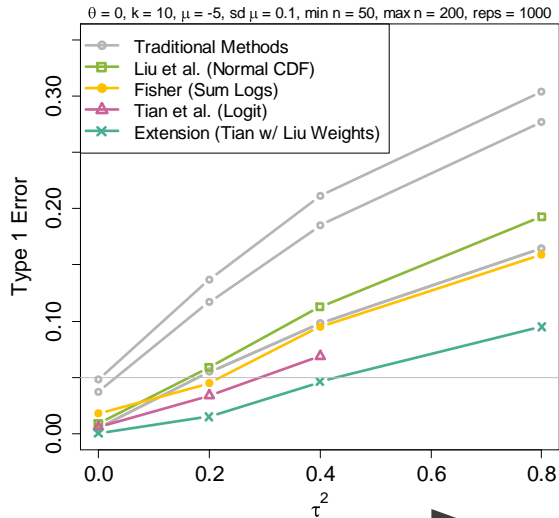
Improvements

Rare Events
(baseline probability: 0.7%)

$$p_c(\theta) = F(c)[w_1 h(p_1(\theta)) + \dots + w_6 h(p_6(\theta))]$$

Can we lower the Type I Error rate by using methods better suited for meta-analyses with rare events?

YES!



Fast, ↑ Error
Fast, ↑ Error
Slow, ↓ Error
Fast, ↓ Error

Rates Differ Between TRT and CTRL

Thank you!

D. Liu, R. Y. Liu, and M. Xie. Exact Meta-Analysis Approach for Discrete Data and its Application to 2×2 Tables With Rare Events. *Journal of the American Statistical Association*, 109(508):1450-1465, 2014.

K. Singh, M. Xie, and W. E. Strawderman. Combining Information from Independent Sources through Confidence Distributions. *The Annals of Statistics*, 33(1):159-183, 2005.

L. Tian, T. Cai, M. A. Pfeer, N. Piankov, P. Cremieux, and L. J. Wei. Exact and efficient inference procedure for meta-analysis and its application to the analysis of independent 2×2 tables with all available data but without artificial continuity correction. *Biostatistics*, 10(2):275-281, 2009.