

Diskussion:

Verwendung von Vorwissen in statistischen Analysen – Frequentistische vs. Bayesianische Verfahren

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Kooperation mit Silvia Calderazzo und Manuel Wiesenfarth

- Tim Mathes: *Faktoren, die die Angemessenheit des Borgens von Informationen beeinflussen können*
- Oliver Sailer: *Bayesian borrowing in a pharmaceutical company*
- Steven Teerenstra: *Frequentist thoughts about borrowing of historical control data*
- Christian Röver: *Calibrated borrowing: getting the questions and answers right*

Borrowing of external data: Frequentist Operating Characteristics



UMP = Uniformly Most Powerful (Test)

Borrowing of external data: Frequentist Operating Characteristics

- If a Uniformly Most Powerful (UMP) test exists in the specific hypothesis test situation
 - no test can have more power.
- True irrespective of borrowing approach!



AKS et al, Power gains by using external information in clinical trials are typically not possible when requiring strict type I error control, *Biom J* 2020

Borrowing of external data: Frequentist Operating Characteristics

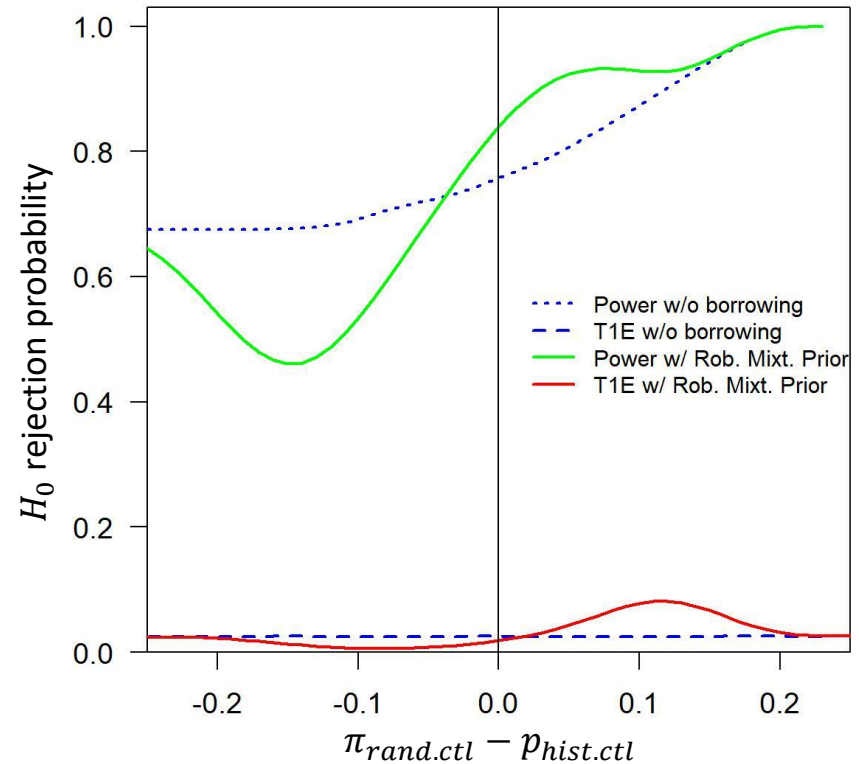
- Evaluate FOC for **all values** of conflict

$$\pi_{rand.ctl} - p_{hist.ctl}$$

Note: $\pi_{rand.ctl}$ is unknown.

- For fair comparison with no-borrowing-approach
→ calibrate to borrowing.

AKS et al, Simulating and reporting frequentist operating characteristics of clinical trials that borrow external information: Towards a fair comparison in case of one-arm and hybrid control two-arm trials, *Pharm Stat* 2024.



„Viele et al 2014 set up“:

Current trial: 200 exp, 200 control.

Historical control: $p_{hist.ctl} = 65/100$.

Power evaluated at $\pi_{exp} - \pi_{rand.ctl} = 0.12$

Borrowing of external data: Operating Characteristics

- When designing a clinical trial:
 - Observed historical control data ($p_{hist.ctl}$) considered fixed \rightarrow „conditional approach“.
 - Frequentist operating characteristics evaluated at selected parameters ($\pi_{exp} - \pi_{rand.ctl}$).
- When investigating frequentist operating characteristics of a borrowing method:
 - External data may be considered random (generated from $\pi_{hist.ctl}$) \rightarrow „unconditional approach“.
- Frequentist operating characteristics evaluate decisions for specific parameters of current data.
For Bayesian calibration: Average with respect to design prior \rightarrow choice of design prior?