Simulating power in practice

Author: Nicholas G Reich, Jeff Goldsmith

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Today's Lecture

- What is statistical power?
- Why/how might we want to simulate it?
- An example

Refresher: statistical power

Definition of statistical power

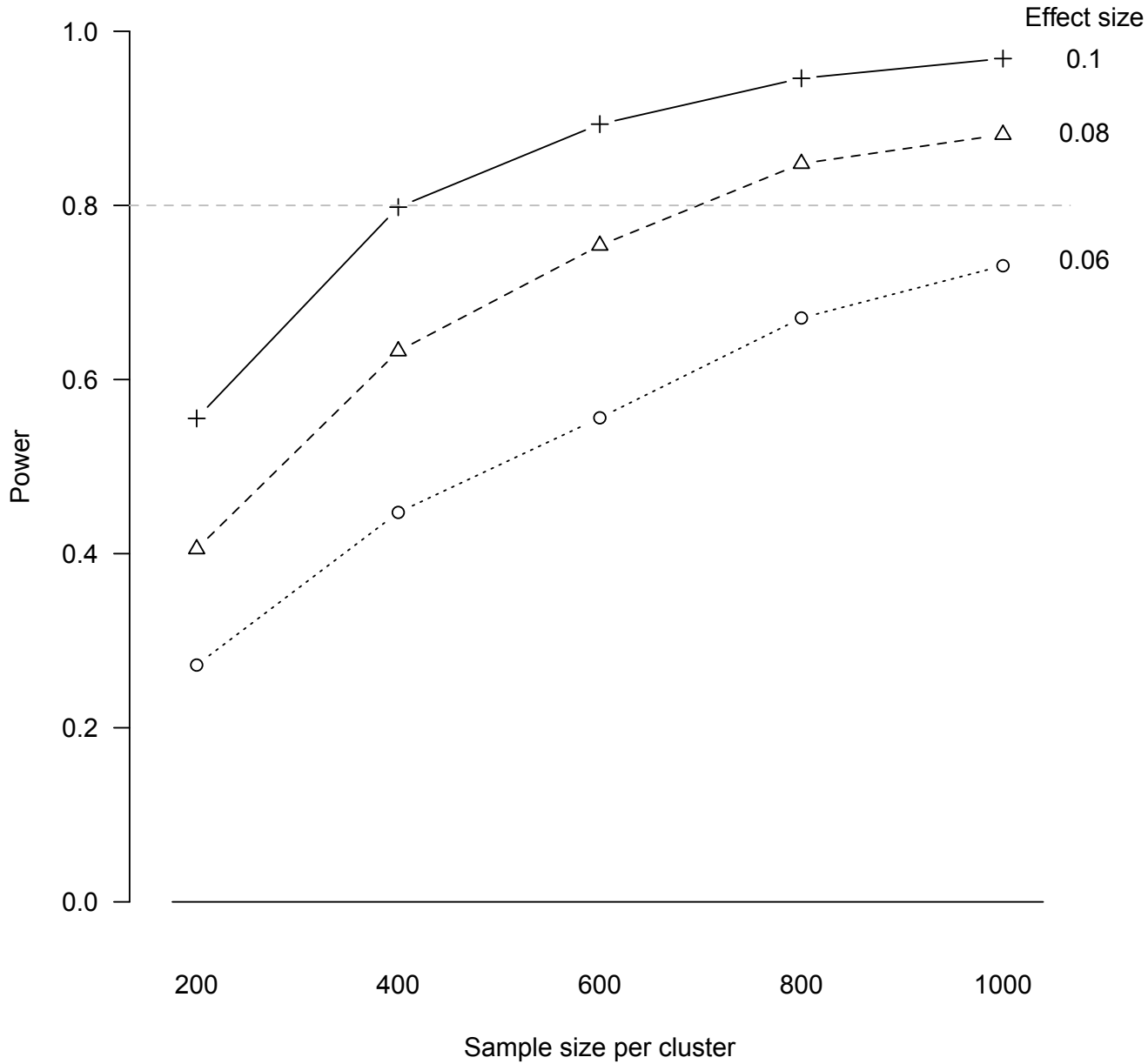
- The ability of a method/test to detect an effect, conditional on that effect actually existing.
- The probability that our test rejects the null hypothesis when the null hypothesis is not true.

Characteristics that impact power

What imapct do increases in these features have on power?

- sample size
- effect size
- variance of outcome
- variance of predictors
- number of predictors
- grouped/clustered observations

Typical power curve



Reich NG, Myers JA, Obeng D, Milstone AM, Perl TM. Empirical power and sample size calculations for cluster-randomized and cluster-randomized crossover studies. PLoS ONE. 2012. 7(4): e35564.

"Post-hoc" power calculations are controversial

It is *always* preferable to calculate power prior to running your analysis.
The Abuse of Power

Power calculation: formulas vs simulation

Many simple tests have formulas for power, these ...

- are easy to use
- may require you to estimate parameters from existing data (or make up justifiable numbers to plug in)
- are often appropriate for simple tests
- assume all standard assumptions are met
- are only available for simple/standard tests

Calculating power via simulation is a tradeoff: computational complexity for customization and flexibility.

Warnings about simulation

Many simple tests have formulas for power, these ...

- simulations are not assumption- or parameter-free
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- are often appropriate for simple tests
- assume all standard assumptions are met
- are only available for simple/standard tests

Calculating power via simulation is a tradeoff: computational complexity for customization and flexibility.