# Data Support for Swedish Pharmacy Residents

Jack B. Huber, Ph.D.

May 2022

# Purpose of this Document

The purpose of this document is to assemble some advice and resources to support Swedish Pharmacy residents in their journey from project proposal to a completed research project.

# Planning your Project

## The causal logic of your project

Fundamentally, the resident research project is an effort to gather causal evidence for the claim that a particular treatment or way of utilizing medicine "worked" by being more effective than a rival. To plan data collection for the strongest causal evidence is the purpose of research design [Campbell and Stanley, 1963]. The ideal research design would be a pure experiment with random assignment. Because the resident research does not randomly assign patients to conditions, it falls under the category of ***quasi-experiment*** which means it is more vulnerable to threats to validity.

The resident research project will culminate in a comparison between two groups: a pre-implementation group and a post-implementation group.

## How many patients?

Possibly the most pressing question for resident research projects is: How many patients do I need? The resident research project will culiminate in a series of comparisons between the pre-implementation and post-implementation groups. Outcomes of the two samples will differ by at least some quantity. The resident researcher expresses this difference as an effect, like this:

Assume that this effect suggests more favorable outcomes for the post-implementation group. This effect raises several questions:

- How do we evaluate this effect?
- Could we attribute it to chance? (because it would be very unlikely for both groups to have exactly the same outcomes)
- Or is it larger than that?

In statistical terms, this is a question of **statistical power**. Power is the ability to isolate a treatment effect when it really does exist [Cohen, 1988]. Power is a function of effect size, sample size, and statistical significance. In order to decide on a number of patients we need to have a sense of what size of effect we want to reliably detect.

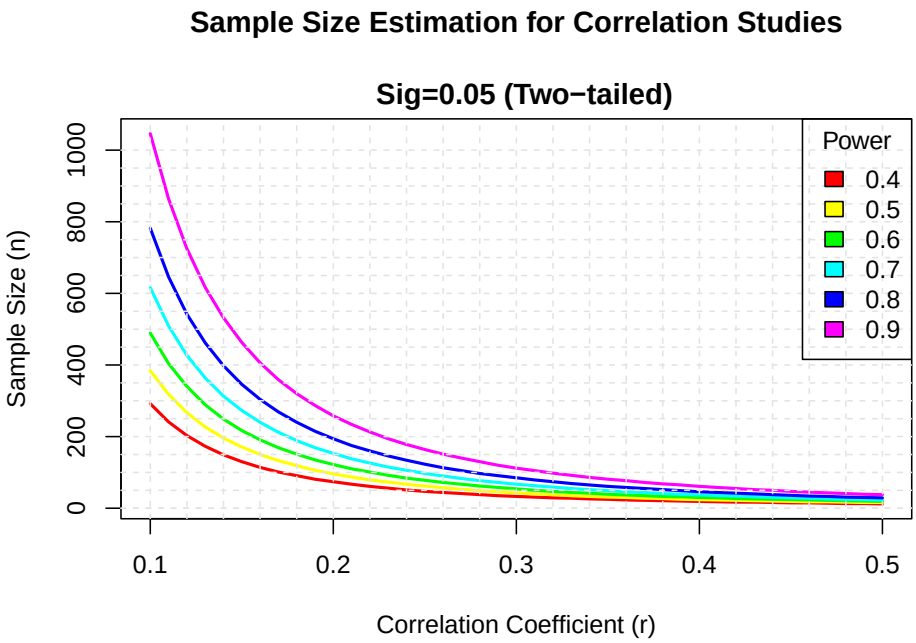


Figure 1: Power Analysis

# Collecting your Data

## Data Sources

- Epic
- Cogito dashboards
- SlicerDicer
- Custom reporting (SQL)

## Granularity

- Patient-level data
- Encounter level data
- Medication administration level data
- Lab results level data

## Advice for Data Collection

1. Define the most critical variables.
2. Study an exemplar (provided).
3. We need to figure out version control. Data proliferation and overload.

# Analyzing your Data

You have data. Congratulations! Let's analyze!

## Preparing your data for analysis

The first step is to complete a number of tasks to prepare your data for analysis. One data matrix. See the exemplar.

## Choosing appropriate statistics

It is important to know the measurement level of your variables. How do you express the outcome by which to compare your pre- and post- samples? Is it…

- Mortality rate (% surviving)? In such a case you would be comparing two proportions.
- "Time to…" a therapeutic level? In such a case you would be comparing two different quantities of time.

### Odds ratios

### Chi-square test of independence

### Two-sample t-test

### Z test of the difference of proportions

### Cohen's *d* effect size

# Reporting your Results

## Advice on graphs

## Advice on tables

# Bibliography

Donald T. Campbell and Julian C. Stanley. *Experimental and Quasi-Experimental Designs for Research*. Houghton Mifflin Company, 1963.

Jacob Cohen. *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Mahwah, New Jersey, 2nd edition, 1988.