stat_power

2024-05-25

Question one. Two-sample sample size estimation

An investigator is planning to study the association between coffee consumption and average grade point among college seniors. The plan is to categorize students as heavy drinkers of coffee as those using 5 or more cups of coffee on a typical day as the criterion for heavy consumption. Mean grade point averages will be compared between students classified as heavy drinker versus non-heavy drinkers, using a two-sample unpaired test of means. The standard deviation in the grade point averages is assumed to be 0.42 and a meaningful difference in grade point averages (relative to coffee consumption status) is 0.25 units. How many college seniors should be enrolled in the study to ensure that the power of the test is 80% to detect a 0.25 unit difference in mean grade point? Use a two-sided test with a 5% level of significance. This can be explored using the power.t.test function. The delta value is 0.25 (the unit difference in mean grade point), the standard deviation is 0.42, the alpha value is 0.05, and the required power is 0.8. The required t-test will be two-sampled, and two-sided.

Known the test and need know sample size

```
power.t.test(d = 0.25, sd = 0.42, sig.level = 0.05, power = 0.8,
type = "two.sample", alternative = "two.sided")
```

```
##
##      Two-sample t test power calculation
##
##               n = 45.28604
##           delta = 0.25
##              sd = 0.42
##       sig.level = 0.05
##           power = 0.8
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

You require 46 students in each group (heavy vs non-heavy drinkers).

Known the size and need know power and more size

```
power.t.test(d = 0.25, sd = 0.42, sig.level = 0.05, n = 23,
type = "two.sample", alternative = "two.sided")
```

```
##
##      Two-sample t test power calculation
##
##               n = 23
##           delta = 0.25
##              sd = 0.42
##       sig.level = 0.05
##           power = 0.5057614
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

The statistical power here is 0.5057614 which less than 0.8 so we need to add more samples in each group.

```
power.t.test(d = 0.25, sd = 0.42, sig.level = 0.05, power = 0.8,
type = "two.sample", alternative = "two.sided")
```

```
##
##      Two-sample t test power calculation
##
##               n = 45.28604
##           delta = 0.25
##              sd = 0.42
##       sig.level = 0.05
##           power = 0.8
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

You require 46 students in each group (heavy vs non-heavy drinkers).

Know nothing but what to test

```
power.t.test(d = the difference of two groups, sd = (sd_group_1 + sd_group_2) / 2 ,
             sig.level = 0.05, power = 0.8,
type = c("two.sample","one.sample","paired.sample"), alternative = "two.sided")
```

race (of people)	*WT*	*het*
White	0.42	0.28
Black	0.03	0.07
Asian	0.10	0.10

Chisq Power

```r
prob<-matrix(c(.42,.28,.03,.07,.10,.10),byrow=TRUE,nrow=3)
library(pwr)
```

```
## Warning: package 'pwr' was built under R version 4.3.3
```

```r
ES.w2(prob)
```

```
## [1] 0.1853198
```

```r
pwr.chisq.test(w=.1853,df=2,sig.level=.05,power=.9)
```

```
##
##      Chi squared power calculation
##
##               w = 0.1853
##               N = 368.5317
##              df = 2
##       sig.level = 0.05
##           power = 0.9
##
## NOTE: N is the number of observations
```