Consulting Homework 10

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a. Sample size calculations.

i. Assuming a known SD

Table 1: Total absorbed zinc (AZ) by dose

ID	2mg	5mg	10mg	15mg	20mg	30mg
1	1.81	3.55	8.28	10.33	6.7	13.28
2	1.77	5	8.33	11.28	9.77	12.14
3	2.09	NA	7.57	10.57	13.38	13.42
4	1.09	NA	7.99	12.4	10.95	9.83
5	1.66	3.81	7.94	10.46	16.32	11.54
6	1.91	4.33	5.4	7.18	4.74	9.66
7	1.31	1.28	6.71	6.25	17.13	7.52
8	1.28	3.13	7.04	7.54	8.68	12.36
SD	0.3500204	1.2728812	0.9937771	2.2077878	4.4094944	2.048961

Using the SD for the 2 mg group, because both the low and high zinc content groups are expected to absorb < 2 mg per day (90% power, alpha = 0.05):

$$n = \frac{(\sigma_1^2 + \sigma_2^2)(Z_{0.9} + Z_{0.975})^2}{(\text{detectable difference})^2} = \frac{(0.3500204^2 + 0.3500204^2) * (1.28 + 1.96)^2}{(0.6)^2} = \frac{2.572212}{0.36} = 7.145033$$

So for 90% power to detect a difference in AZ of 0.6 mg/day, assuming known variation, Jamie will need 8 participants in each group.

ii. Assuming an unknown SD

Use R's built-in power calculation function:

```
power.t.test(delta = 0.6,sd = s,power = 0.9,type = "two.sample")
```

```
##
##      Two-sample t test power calculation
##
##               n = 8.242291
##           delta = 0.6
##              sd = 0.3500204
##       sig.level = 0.05
##           power = 0.9
##     alternative = two.sided
##
## NOTE: n is number in *each* group
```

With an unknown variance, R recommends a sample size of 9 participants per group.

b. Sample size summary

The standard deviation for AZ after a 2 mg dose of zinc was used as an estimate of within group variation. This value is 0.35 mg/day. Assuming an alpha level of 0.05 for a two-sided test comparing two groups, a sample size of 9 subjects per group provides 90% power to detect a difference in AZ between groups of 0.6 mg/day. This is a clinically meaningful difference that we consider a realistic expectation of the intervention in this study. Assuming a drop-out rate of 20%, we will recruit 11 subjects per group.

c. Statistical analysis summary

Primary outcome is total zinc absorption. Statistical analyses will be carried out using R. A two sided t test with significance level 0.05 will be used to compare absorption between the high and low zinc content groups.