## S2S3Chpt

## S2-10

prop 1

## 0.753012 0.668000

prop 2

1. The 95% confidence interval for the difference in proportions is [0.006942351, 0.163081746]. This doesn't contain the value 0.

```
##
## 2-sample test for equality of proportions with continuity correction
##
data: c(250, 167) out of c(332, 250)
## X-squared = 4.664, df = 1, p-value = 0.0308
## alternative hypothesis: two.sided
## 98 percent confidence interval:
## -0.006996134 0.177020231
## sample estimates:
```

prop.test(c(250, 167), c(332, 250), conf.level = 0.98)

- 2. The 98% confidence interval for the difference in proportions is [-0.006996134, 0.177020231]. This DOES contain the value 0.
- 3. The p-value in both cases is the same, that is, 0.0308. This is because the data that we provide in both cases was the same. The 98% interval contains 0 because the size of the interval is larger, and since the 95% interval was already very close to zero, the 98% interval covers just a little larger radius, thereby incorporating the value 0 into the interval.
- 4. A more severe winter must have less than 75.3012% hives survive it. H0: p2 >= 0.753012, that is, the survival rate of the hives in the second winter is greater than or equal to the rate in the first winter, which was 250/332. H1: p2 < 0.753012, that is, the second winter was more severe.

```
prop.test(c(250, 167), c(332, 250), alternative = c("less"))
```

```
##
## 2-sample test for equality of proportions with continuity correction
##
## data: c(250, 167) out of c(332, 250)
## X-squared = 4.664, df = 1, p-value = 0.9846
## alternative hypothesis: less
## 95 percent confidence interval:
## -1.0000000 0.1510939
## sample estimates:
## prop 1 prop 2
## 0.753012 0.668000
```

Here, we can see that the p-value is 0.9846 which is quite high. This means that it is highly likely for the second winter to have a survival rate of 66.8% (as indicated by p2 = 66.8%).

S2-12

```
# The original test with alpha = 0.05
power.prop.test(n=c(250, 350, 450, 550),
p1=0.7, p2=0.6, sig.level = 0.05,
alternative = c("one.sided"))
##
##
        Two-sample comparison of proportions power calculation
##
##
                 n = 250, 350, 450, 550
##
                p1 = 0.7
                p2 = 0.6
##
         sig.level = 0.05
##
##
             power = 0.7589896, 0.8717915, 0.9342626, 0.9672670
##
       alternative = one.sided
##
## NOTE: n is number in *each* group
# Now the modified test with the value of alpha = 0.02
power.prop.test(n=c(250, 350, 450, 550),
p1=0.7, p2=0.6, sig.level = 0.02,
alternative = c("one.sided"))
##
##
        Two-sample comparison of proportions power calculation
##
                 n = 250, 350, 450, 550
##
##
                p1 = 0.7
##
                p2 = 0.6
##
         sig.level = 0.02
##
             power = 0.6148167, 0.7653872, 0.8637122, 0.9237709
       alternative = one.sided
##
##
## NOTE: n is number in *each* group
# To calculate the difference in powers
c(0.7589896, 0.8717915, 0.9342626, 0.9672670) - c(0.6148167, 0.7653872, 0.8637122, 0.9237709)
```

## [1] 0.1441729 0.1064043 0.0705504 0.0434961

We see that there is quite a significant decrease in power when we go from alpha = 0.05 to 0.02. We can also notice that as the sample size increases, the difference between the 2 reduces. The power decreases since when we decrease alpha, the critical value increases. meaning the probability to get a Type II error increases. Therefore, since it is more likely to get a Type II error, the power decreases.

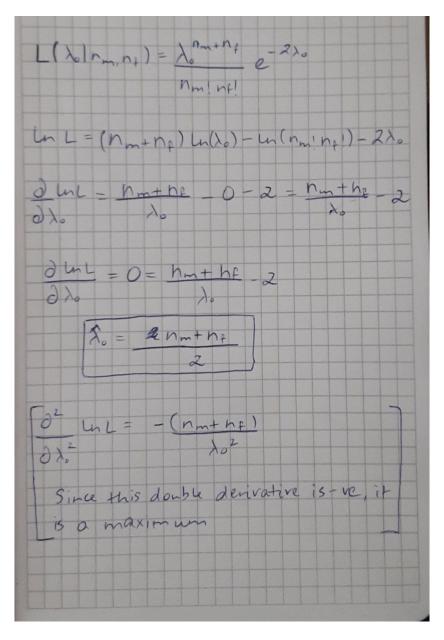


Figure 1: S3 Chpt