Lecture 11 HW

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September 29, 2018

Question 3.19

A study in the department of wildlife ecology sampled wild common carp fish from a wetland in central Chile. One analysis investigated whether the fish muscle had lead pollutant and whether there was evidenct malformation in the fish. Of 25 fish without lead, 7 had malformation. Of 14 with lead, 7 had malformation. Report and interpret the p value for Fisher's exact test for a one sided alternative of a greater chance of malformation when there is lead pollution.

```
fish <- matrix(c(7,7,7,18), byrow = TRUE, nrow = 2)
dimnames(fish) <- list(lead=c("yes", "no"),
                       malform=c("yes", "no"))
fish
```

```
##      malform
## lead  yes no
##   yes   7  7
##   no    7 18
```

```
fisher.test(fish, alternative = "greater", conf.level = 0.95)
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  fish
## p-value = 0.1526
## alternative hypothesis: true odds ratio is greater than 1
## 95 percent confidence interval:
##  0.6600769       Inf
## sample estimates:
## odds ratio
##   2.506137
```

Indicates that the probability of a table with a larger number of malformation in fish with lead is 0.1526.

Additional Problem

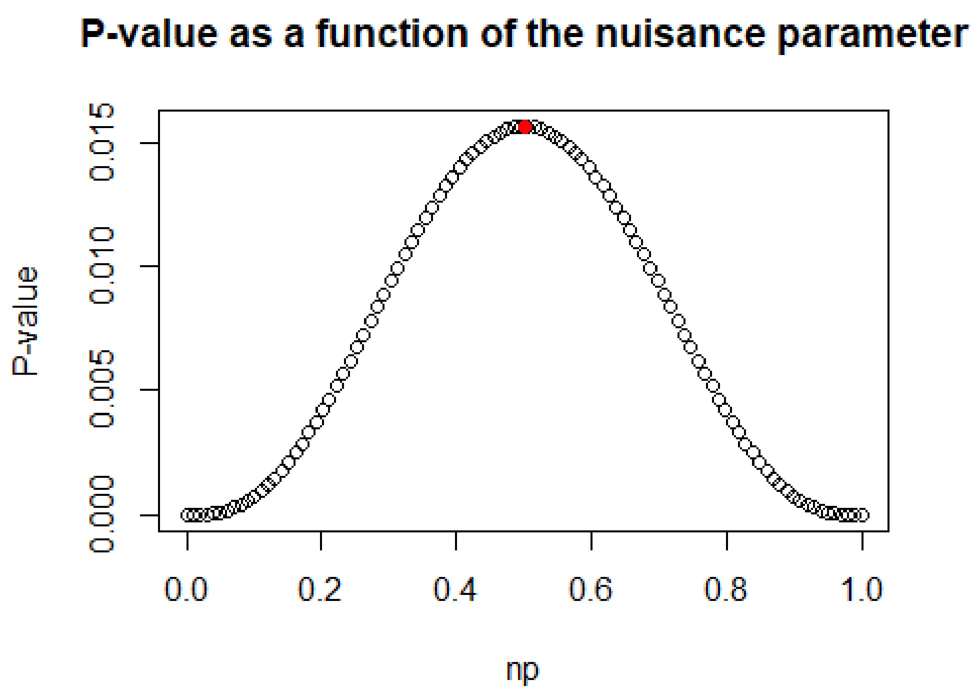
A contingency table for two independent binomial variables where Y=1 denotes success and Y=2 failure has three of three successes in row one and zero of three successes in row two. For H0: Pi_1<=Pi_2 versus Pi_1>Pi_2 , show that the p-value for the unconditional exact test equals 1/64 and for Fisher's exact test equal 1/20. (Hint: see p 94, which has H0: Pi_1=Pi_2.)

```
ex <- matrix(c(3,0,0,3), byrow = TRUE, nrow = 2)
dimnames(ex) <- list(x=c("a","b"),
                     y=c("success","fail"))
ex

##    y
## x   success fail
##   a       3    0
##   b       0    3
```

Unconditional Exact Test

```
library("Exact")
exact.test(ex, alternative="greater")
```




```
##
##  z-pooled
##
## data:  3 out of 3 vs. 0 out of 3
## test statistic = 2.4495, first sample size = 3, second sample size
## = 3, p-value = 0.01562
## alternative hypothesis: true difference in proportion is greater than 0
## sample estimates:
## difference in proportion
##                        1
```

Fisher's Test

```
fisher.test(ex,alternative = "greater", conf.level = 0.95)

##
##  Fisher's Exact Test for Count Data
##
## data:  ex
## p-value = 0.05
## alternative hypothesis: true odds ratio is greater than 1
## 95 percent confidence interval:
##    1 Inf
## sample estimates:
## odds ratio
##        Inf
```

Session Info

```
sessionInfo()

## R version 3.4.1 (2017-06-30)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 16299)
##
## Matrix products: default
##
## locale:
## [1] LC_COLLATE=English_United States.1252
## [2] LC_CTYPE=English_United States.1252
## [3] LC_MONETARY=English_United States.1252
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] Exact_1.7
##
## loaded via a namespace (and not attached):
##  [1] compiler_3.4.1  backports_1.1.0 magrittr_1.5    rprojroot_1.2
##  [5] tools_3.4.1     htmltools_0.3.6 yaml_2.1.14     Rcpp_0.12.13
##  [9] stringi_1.1.5   rmarkdown_1.6   knitr_1.16      stringr_1.2.0
## [13] digest_0.6.12   evaluate_0.10.1
```