Practical: Effect Estimates Binary Data

Alice Kamau

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We will use various R packages that one may use to compute these measures such as epicalc, Epi, epiR, and epitools to obtain effet estimates for binary data

Part 1: Load the dataset

We will use the lung capacity dataset to compute effect estimates for binary data (Risk Ratio and Odds Ratio)

Load the *LungCapData.csv* dataset into memory.

```
LungCapData<-read.csv("/Users/akamau/Desktop/Stats forum/Stat training/LungCapData.csv", header=TRUE)
```

Part 2: Explore the dataset

```
attach(LungCapData)
names(LungCapData)
class(Gender)
levels(Gender)
class(Smoke)
levels(Smoke)
```

Explore the relationship between various variables

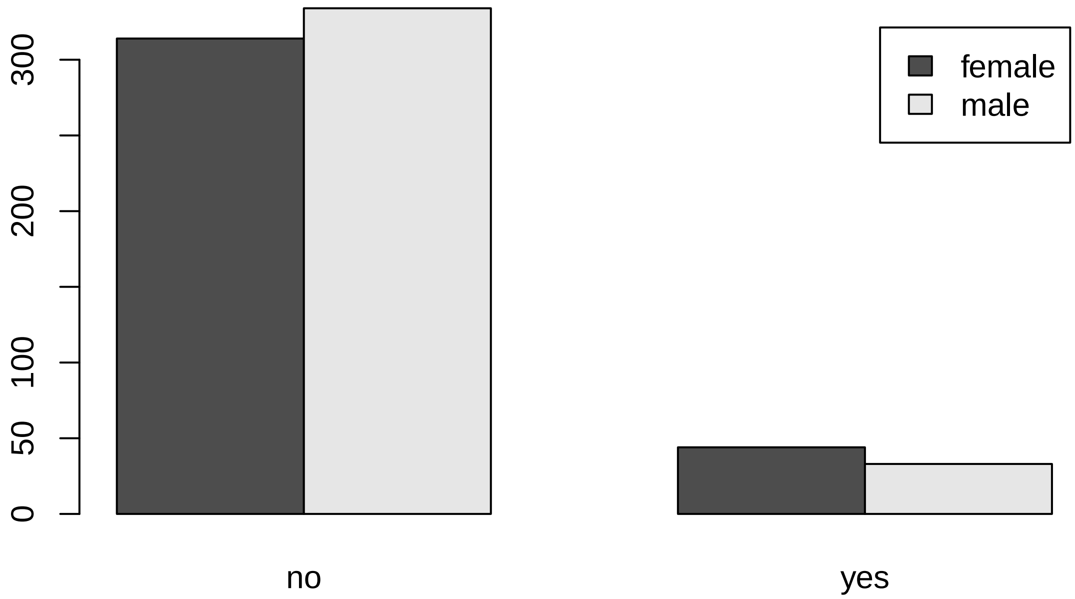
Load the R packages 'ggplot2', 'lme4','descr'. Use the help function to determine what each package does e.g. ?ggplot

```
library(ggplot2)
library(lme4)
library(descr)
```

```
tab<-table(Gender, Smoke)
tab
```

```
##         Smoke
## Gender    no yes
##   female 314  44
##   male   334  33
```

```
barplot(tab, beside=T, legend=T)
```




```r
chisq.test(tab, correct = F)
```

```
##
##  Pearson's Chi-squared test
##
## data:  tab
## X-squared = 2.0773, df = 1, p-value = 0.1495
```

```r
fisher.test(tab, conf.int=T, conf.level=0.95)
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  tab
## p-value = 0.1845
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.4233701 1.1659426
## sample estimates:
## odds ratio
##  0.7054345
```

Part 3: Load the R package 'epitools', 'epiR', 'abd' to calculate the RR and OR

```r
library(epitools)
library(epiR)
library(abd)
library(epiDisplay)
```

Part 4: Calculate the Risk Ratio and Odds Ratios

Recall the table 'tab'. We need to set it in the standard abcd format.The standard format dictates that the exposure be presented in rows while the outcome be presented in columns

```
tab2<-cbind(tab[,2],tab[,1])
colnames(tab2)<-c("yes","no")
tab2
```

```
##        yes  no
## female  44 314
## male    33 334
```

```
fisher.test(tab2, conf.int=T, conf.level=0.95)
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  tab2
## p-value = 0.1845
## alternative hypothesis: true odds ratio is not equal to 1
## 95 percent confidence interval:
##  0.8576752 2.3619999
## sample estimates:
## odds ratio
##   1.417566
```

Using epitools package

```
epitab(tab2, method="oddsratio")
```

```
## $tab
##        yes        p0  no        p1 oddsratio     lower    upper   p.value
## female  44 0.5714286 314 0.4845679  1.000000        NA       NA        NA
## male    33 0.4285714 334 0.5154321  1.418259 0.8803057 2.284955 0.1845426
##
## $measure
## [1] "wald"
##
## $conf.level
## [1] 0.95
##
## $pvalue
## [1] "fisher.exact"
```

Using epiR package

```
epitab(tab2, method="riskratio", rev="both")
```

```
## $tab
##         no        p0 yes         p1 riskratio     lower    upper   p.value
```

```
## male   334 0.9100817  33 0.08991826  1.000000        NA      NA        NA
## female 314 0.8770950  44 0.12290503  1.366853 0.8916263 2.09537 0.1845426
##
## $measure
## [1] "wald"
##
## $conf.level
## [1] 0.95
##
## $pvalue
## [1] "fisher.exact"
```

```r
epi.2by2(tab2, method="cohort.count",conf.level=0.95)
```

```
##              Outcome +    Outcome -      Total        Inc risk *
## Exposed +           44          314        358             12.29
## Exposed -           33          334        367              8.99
## Total               77          648        725             10.62
##                  Odds
## Exposed +      0.1401
## Exposed -      0.0988
## Total          0.1188
##
## Point estimates and 95 % CIs:
## ---------------------------------------------------------
## Inc risk ratio (W)                          1.37 (0.89, 2.10)
## Odds ratio (W)                              1.42 (0.88, 2.28)
## Attrib risk (W) *                           3.30 (-1.19, 7.79)
## Attrib risk in population (W) *             1.63 (-2.06, 5.32)
## Attrib fraction in exposed (%)              26.84 (-12.15, 52.28)
## Attrib fraction in population (%)           15.34 (-8.10, 33.69)
## ---------------------------------------------------------
##  X2 test statistic: 2.077 p-value: 0.15
##  W: Wald confidence limits
##  * Cases per 100 population units
```

Part 5: Interpretation

The odds of smoking among female is 1.42 times higher than the odds of smoking among male ##Refer the example on the relationship between lung cancer and smoking **

Using the example used in the slides to compute effect estimates using R **

```r
smoking <- matrix(c(709, 154, 142, 308), nrow = 2)
rownames(smoking) <- c("smokers", "non-smokers")
colnames(smoking) <- c("lungcancer", "no-lung cancer")


smoking
```

```
##              lungcancer no-lung cancer
## smokers             709            142
## non-smokers         154            308
```

```r
epi.2by2(smoking, method="cohort.count",conf.level=0.95)
```

```
##              Outcome +    Outcome -      Total        Inc risk *
## Exposed +          709          142        851              83.3
## Exposed -          154          308        462              33.3
## Total              863          450       1313              65.7
##                  Odds
## Exposed +        4.99
## Exposed -        0.50
## Total            1.92
##
## Point estimates and 95 % CIs:
## -----------------------------------------------------------
## Inc risk ratio (W)                          2.50 (2.19, 2.85)
## Odds ratio (W)                              9.99 (7.67, 13.01)
## Attrib risk (W) *                           49.98 (45.01, 54.96)
## Attrib risk in population (W) *             32.39 (27.39, 37.40)
## Attrib fraction in exposed (%)              59.99 (54.33, 64.95)
## Attrib fraction in population (%)           49.29 (43.36, 54.59)
## -----------------------------------------------------------
##  X2 test statistic: 332.057 p-value: < 0.001
##  W: Wald confidence limits
##  * Cases per 100 population units
```

```r
epitab(smoking, method="riskratio", rev="both")
```

```
## $tab
##              no-lung cancer        p0 lungcancer        p1 riskratio
## non-smokers             308 0.6666667        154 0.3333333  1.000000
## smokers                 142 0.1668625        709 0.8331375  2.499412
##                 lower    upper      p.value
## non-smokers        NA       NA           NA
## smokers      2.189428 2.853285 4.826448e-74
##
## $measure
## [1] "wald"
##
## $conf.level
## [1] 0.95
##
## $pvalue
## [1] "fisher.exact"
```

```r
epitab(smoking, method="oddsratio", rev="both")
```

```
## $tab
##             no-lung cancer        p0 lungcancer        p1 oddsratio
## non-smokers            308 0.6844444        154 0.1784473  1.000000
## smokers                142 0.3155556        709 0.8215527  9.985915
##               lower    upper      p.value
## non-smokers      NA       NA           NA
## smokers     7.66614 13.00766 4.826448e-74
##
## $measure
## [1] "wald"
##
## $conf.level
## [1] 0.95
##
## $pvalue
## [1] "fisher.exact"
```

Part 6: Assignment

1. Evaluate the birthweight2 data
2. Look at the association between LBW and gestational weeks. Divide gestwks into quartiles and analyse as groups, check for trend
3. Look at birth weight and maternal age (in groups).
4. Check the Odds ratio for the association between LBW and ethinicity
5. Finally look at LBW and sex, maternal age, height.
6. Make Conclusion