2014627

Contents

(event rate) Peto(Yusuf et. al., 1985) DerSimonian-Laird(DerSimonian and Laird, 1986)Peto Mental-Haenzel(odds ratio)DSL(DerSimonian-Laird)Peto(within-study variation)DSL(among-study variation)

Peto

Peto Mentel-Haenzel$i(i = 1, \cdots, K)Nn_iN_i - n_i2d_i$(event)$O_i(d_i - O_i)$ $E_i = (n_i/N_i)d_iN_i, n_i, d_iO_i$(hypergeometric distribution)$O_i - E_i0V_i = E_i[(N_i - n_i)/N_i][(N_i - d_i)(N_i - 1)]$

$$\frac{\left[\sum_{i=1}^{K}(O_i - E_i)\right]^2}{\sum_{i=1}^{K} V_i}$$

$1\chi^2K$(pooled)

$$\widehat{OR} = exp\left[\frac{\sum_{i=1}^{K}(O_i - E_i)}{\sum_{i=1}^{K} V_i}\right]$$

$\ln(\widehat{OR})$ $SE(\ln\widehat{OR}) = (\sum V_i)^{-1/2}\ln(\widehat{OR})\chi^2$-$OR100(1-\alpha)\%$

$$exp\left[\frac{\sum(O_i - E_i)}{\sum V_i} \pm \frac{Z_{\alpha/2}}{\sqrt{\sum V_i}}\right]$$

$$Q = \sum\left[\frac{(O_i - E_i)^2}{V_i}\right] - \frac{[\sum(O_i - E_i)]^2}{\sum V_i}$$

$K - 1\chi^2\chi^2_\alpha(K-1)$

DerSimonian-Laird

$i(i = 1, \cdots, K)d_{t_i}d_{c_i}n_{t_i}n_{c_i}$

$$\hat{\theta}_i = \hat{p_{t_i}} - \hat{p_{c_i}} = d_{t_i}/n_{t_i} - d_{c_i}/n_{c_i}$$

$$S_i = \frac{\hat{p_{t_i}}(1-\hat{p_{t_i}})}{n_{t_i}} + \frac{\hat{p_{c_i}}(1-\hat{p_{c_i}})}{n_{c_i}}$$

$$Q = \sum w_i(\hat{\theta}_i - \bar{\theta}_w)^2$$

$w_i = S_i^{-1}\bar{\theta}_w = \sum w_i\hat{\theta}_i/\sum w_in_{c_i}n_{t_i}QK - 1\chi^2$

i-$\theta_i\theta_i\mu\tau^2$

$$\hat{\tau}^2 = \max\left[0, \frac{Q-(K-1)}{\sum w_i - (\sum w_i^2 / \sum w_i)}\right]$$

$w_i^* = (S_i + \hat{\tau}^2)^{-1}$

$$\hat{\mu} = \frac{\sum w_i^* \hat{\theta}_i}{\sum w_i^*}$$

$SE(\hat{\mu}) = (\sum w_i^*)^{-1/2}$

Rmeta package

R **meta**Fleiss(1993)Aspirin **meta**

```
library(meta)
```

```
## Loading required package: grid
## Loading 'meta' package (version 3.6-0).
```

```
data("Fleiss93")
Fleiss93
```

```
##    study year event.e  n.e event.c  n.c
## 1  MRC-1 1974      49  615      67  624
## 2    CDP 1976      44  758      64  771
## 3  MRC-2 1979     102  832     126  850
## 4   GASP 1979      32  317      38  309
## 5  PARIS 1980      85  810      52  406
## 6   AMIS 1980     246 2267     219 2257
## 7 ISIS-2 1988    1570 8587    1720 8600
```

```
metabin
```

```
m1 <- metabin(event.e, n.e, event.c, n.c, data=Fleiss93, studlab=paste(study,year), sm="OR")
m1
```

```
##                  OR           95%-CI %W(fixed) %W(random)
## MRC-1 1974  0.7197 [0.4890; 1.0593]      3.18       8.21
## CDP 1976    0.6808 [0.4574; 1.0132]      3.10       7.85
## MRC-2 1979  0.8029 [0.6065; 1.0629]      5.68      13.23
## GASP 1979   0.8007 [0.4863; 1.3186]      1.80       5.36
## PARIS 1980  0.7981 [0.5526; 1.1529]      3.22       8.89
## AMIS 1980   1.1327 [0.9347; 1.3728]     10.15      20.70
## ISIS-2 1988 0.8950 [0.8294; 0.9657]     72.88      35.77
##
## Number of studies combined: k=7
##
##                           OR           95%-CI      z  p.value
## Fixed effect model   0.8969 [0.8405; 0.9570] -3.288   0.001
## Random effects model 0.8763 [0.7743; 0.9917] -2.092   0.0365
```

```
##
## Quantifying heterogeneity:
## tau^2 = 0.0096; H = 1.29 [1; 1.99]; I^2 = 39.7% [0%; 74.6%]
##
## Test of heterogeneity:
##     Q d.f.  p.value
##  9.95    6   0.1269
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

Fixed effect modelPetoRandom effects modelDSL95%ORTest of HomogeneityTest of heterogeneity5%

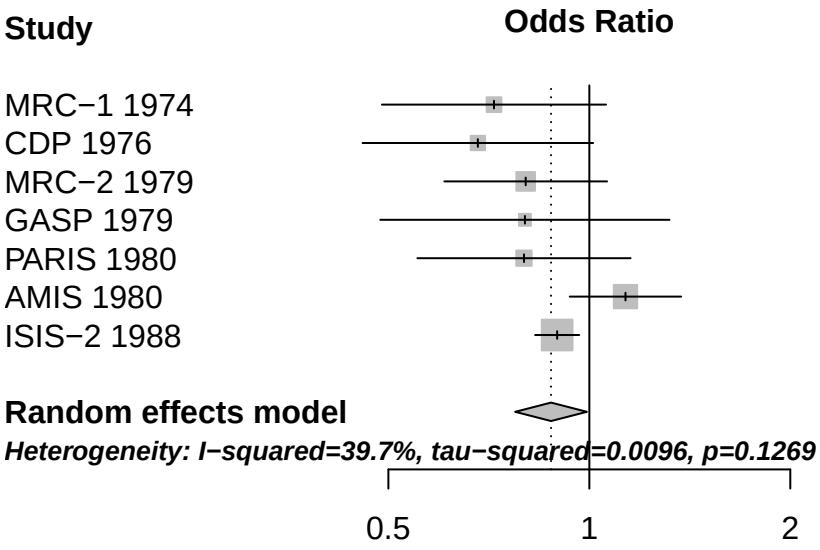
1980

```
summary(m1, byvar=Fleiss93$year<1980, bylab="year<1980")
```

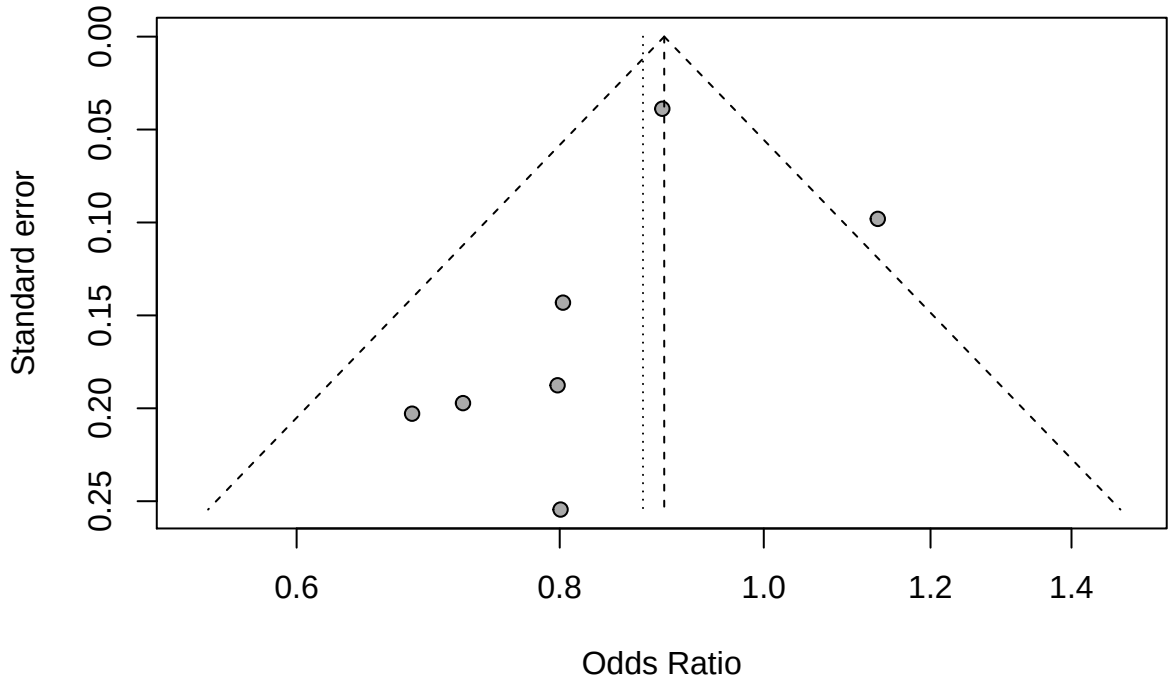
```
## Number of studies combined: k=7
##
##                          OR         95%-CI      z  p.value
## Fixed effect model   0.897 [0.841; 0.957] -3.288   0.001
## Random effects model 0.876 [0.774; 0.992] -2.092   0.0365
##
## Quantifying heterogeneity:
## tau^2 = 0.0096; H = 1.29 [1; 1.99]; I^2 = 39.7% [0%; 74.6%]
##
## Test of heterogeneity:
##     Q d.f.  p.value
##  9.95    6   0.1269
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

(Forest Plot)OR95%

```
forest(m1, comb.fixed = FALSE, leftcols = "studlab", rightcol = FALSE)
```


Study
Odds Ratio
MRC−1 1974
CDP 1976
MRC−2 1979
GASP 1979
PARIS 1980
AMIS 1980
ISIS−2 1988
Random effects model
Heterogeneity: I−squared=39.7%, tau−squared=0.0096, p=0.1269
0.5
1
2

```
funnel(m1)
```


Standard error
0.00
0.05
0.10
0.15
0.20
0.25
0.6
0.8
1.0
1.2
1.4
Odds Ratio