

Meta-analysis (from Greek μετά: After,Beyond) aims to draw a statistical conclusion for the same hypothesis studied in different analyses.

In the example below, 7 papers study the same comparison between the same treatment and placebo patients. They report the proportion of participants who died in a treatment group and those who died in a control group. Each paper then gives a number of patients in a treatment group (n.trt) and in a control group (n.ctrl). Each paper also reports the number of participants who died in the treatment group (ev.trt) and the number of participants who died in the control group (ev.ctrl). The event here is “Death occurred”. Each paper therefore concludes whether there is a difference of proportion of the event “Death occurred” between a treatment and a control group.

```
# Simple Meta-analysis
```

```
library(rmeta)
```

```
data(cochrane)
```

```
cochrane
```

	name	ev.trt	n.trt	ev.ctrl	n.ctrl
1	Auckland	36	532	60	538
2	Block	1	69	5	61
3	Doran	4	81	11	63
4	Gamsu	14	131	20	137
5	Morrison	3	67	7	59
6	Papageorgiou	1	71	7	75
7	Tauesch	8	56	10	7

The table below is a summary of the effect of the treatment vs. control group for the event “Death occurred”. In order to study this effect an odds ratio is calculated:

Odds Ratio = OR = Odds (Dying in the treatment group) / Odds (Dying in the control group)

```
model.FE <- meta.MH(n.trt,n.ctrl,ev.trt,ev.ctrl, names=name,data=cochrane)
```

```
model.RE <- meta.DSL(n.trt,n.ctrl,ev.trt,ev.ctrl, names=name,data=cochrane)
```

```
Fixed effects ( Mantel-Haenszel ) meta-analysis
```

```
Call: meta.MH(ntrt = n.trt, nctrl = n.ctrl, prt = ev.trt, pctrl = ev.ctrl,
names = name, data = cochrane)
```

	OR	(lower	95% upper)
Auckland	0.58	0.38	0.89
Block	0.16	0.02	1.45
Doran	0.25	0.07	0.81
Gamsu	0.70	0.34	1.45
Morrison	0.35	0.09	1.41
Papageorgiou	0.14	0.02	1.16
Tauesch	1.02	0.37	2.77

```
Mantel-Haenszel OR =0.53 95% CI ( 0.39,0.73 )
```

```
Test for heterogeneity: X^2( 6 ) = 6.9 ( p-value 0.3303 )
```

The most important information here of course is the overall Odds Ratio and its confidence interval pointed out in the grey rectangle. We can construct a forest plot to better visualize this summary table.

```

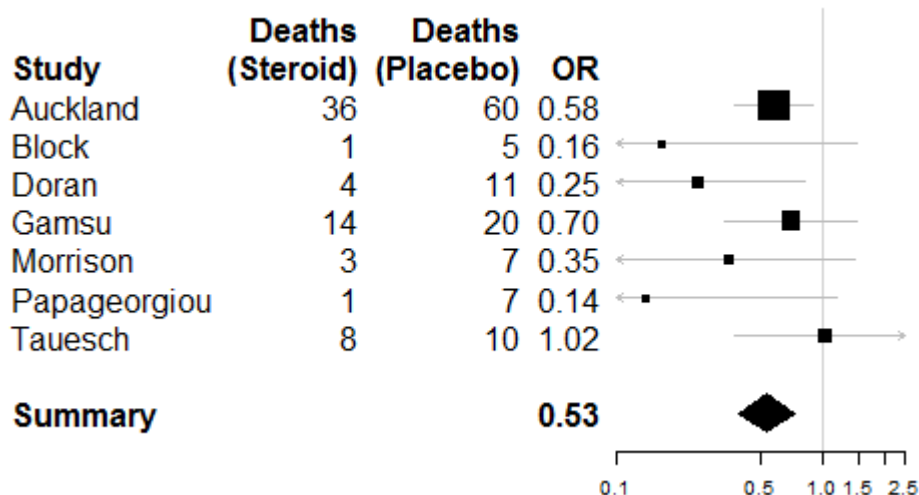
CPplot <- function(model) {
  c1 <- c("", "Study", model$names, NA, "Summary")
  c2 <- c("Deaths", "(Steroid)", cochrane$ev.trt, NA, NA)
  c3 <- c("Deaths", "(Placebo)", cochrane$ev.ctrl, NA, NA)
  c4 <-
  c("", "OR", format(exp(model[[1]]), digits=2), NA, format(exp(model[[3]]), di
gits=2))

  tableText <- cbind(c1, c2, c3, c4)
  mean <- c(NA, NA, model[[1]], NA, model[[3]])
  stderr <- c(NA, NA, model[[2]], NA, model[[4]])
  low <- mean - 1.96*stderr
  up <- mean + 1.96*stderr
  forestplot(tableText, mean, low, up, zero=0,

  is.summary=c(TRUE, TRUE, rep(FALSE, 8), TRUE), clip=c(log(0.1), log(2.5)), xlo
g=TRUE)
}

CPplot(model.FE)

```



The general conclusion is taken from the diamond at the bottom, revealing an Odds Ratio of 0.53. It means that from the meta-analysis, the odds of dying when you are in the treatment group is 1/0.53 = 1.89 times less likely. You would have 89% more chance of surviving if you are part of the treatment group.

The 95% confidence interval of the Odds Ratio is (0.39,0.73) and does not contain 1, therefore there is an overall significant effect of the treatment for the event “Death occurred”.

Source:

<https://www.r-bloggers.com/r-and-meta-analysis/>