

## Appendix B

### A contrast of analyses done using the R packages meta and metafor.

Contrasted meta and metafor using the classic Cochrane bronchoconstriction dataset used in many texts to demonstrate meta-analysis. Here is a link to these data as a tidy csv files on figshare.

#### Meta

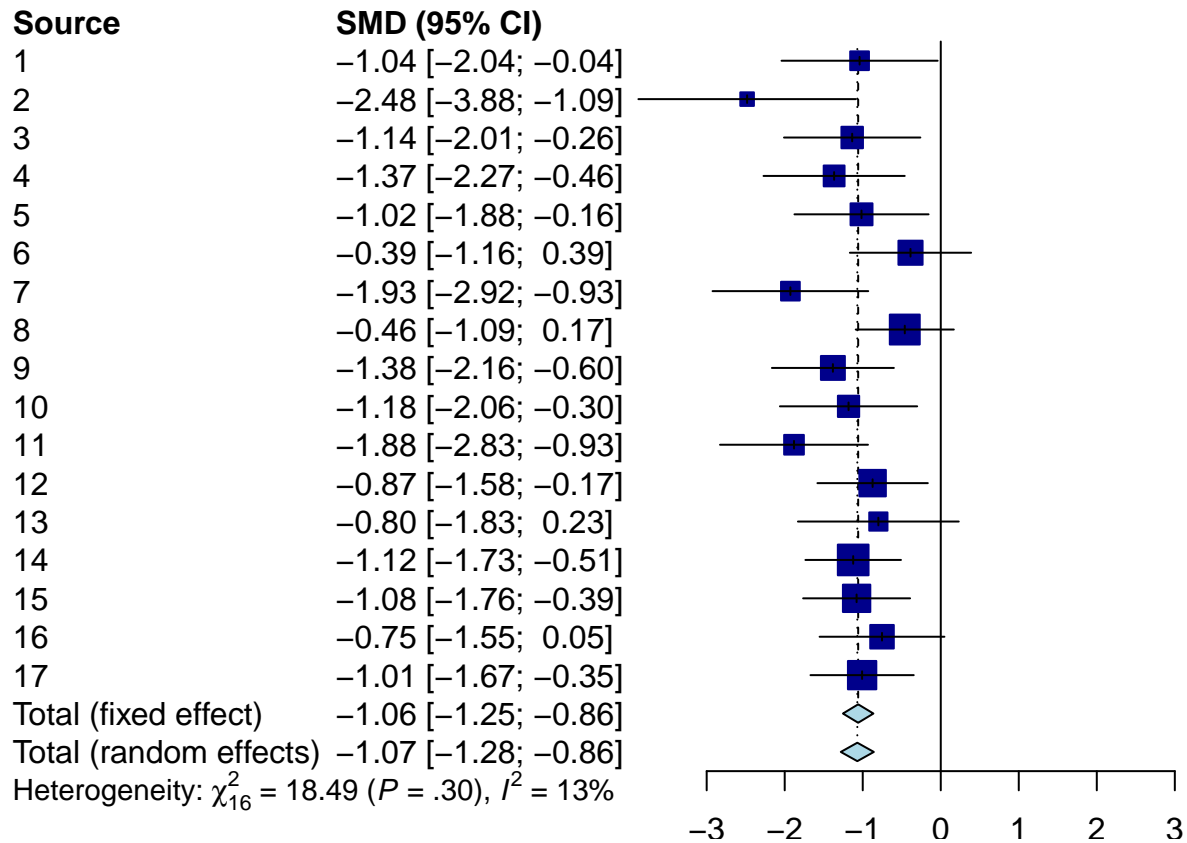
```
#load primary libraries
library(tidyverse) #tidy functions to read and format data
library(meta) #meta package current version effective March 2020

#Classic bronchoconstriction data from Cochrane
data <- read_csv(url("https://ndownloader.figshare.com/files/14460386"))

#continuous data
m1 <- metacont(Ne, Me, Se, Nc, Mc, Sc, data = data, sm = "SMD")
summary(m1)

## Number of studies combined: k = 17
##
##               SMD               95%-CI           z  p-value
## Fixed effect model  -1.0583 [-1.2537; -0.8630] -10.62 < 0.0001
## Random effects model -1.0694 [-1.2813; -0.8575]  -9.89 < 0.0001
##
## Quantifying heterogeneity:
## tau^2 = 0.0265 [0.0000; 0.3559]; tau = 0.1629 [0.0000; 0.5966];
## I^2 = 13.5% [0.0%; 50.2%]; H = 1.08 [1.00; 1.42]
##
## Test of heterogeneity:
##      Q d.f. p-value
## 18.49  16  0.2959
##
## Details on meta-analytical method:
## - Inverse variance method
## - DerSimonian-Laird estimator for tau^2
## - Jackson method for confidence interval of tau^2 and tau
## - Hedges' g (bias corrected standardised mean difference)

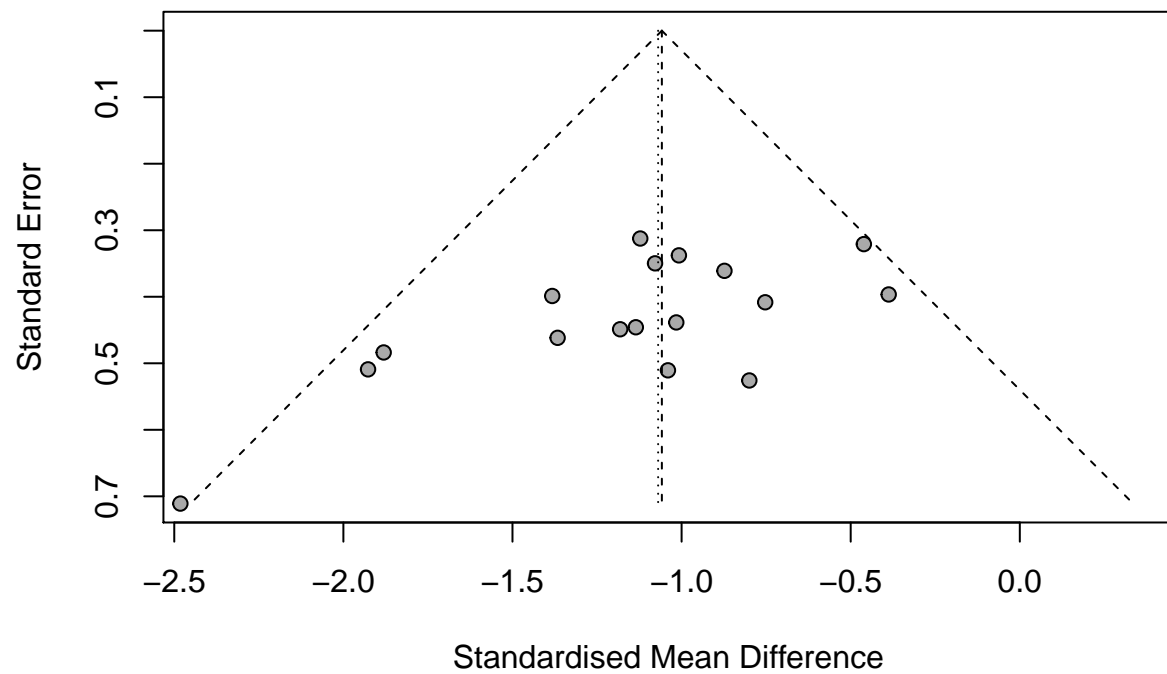
#viz
forest(m1, layout = "JAMA")
```



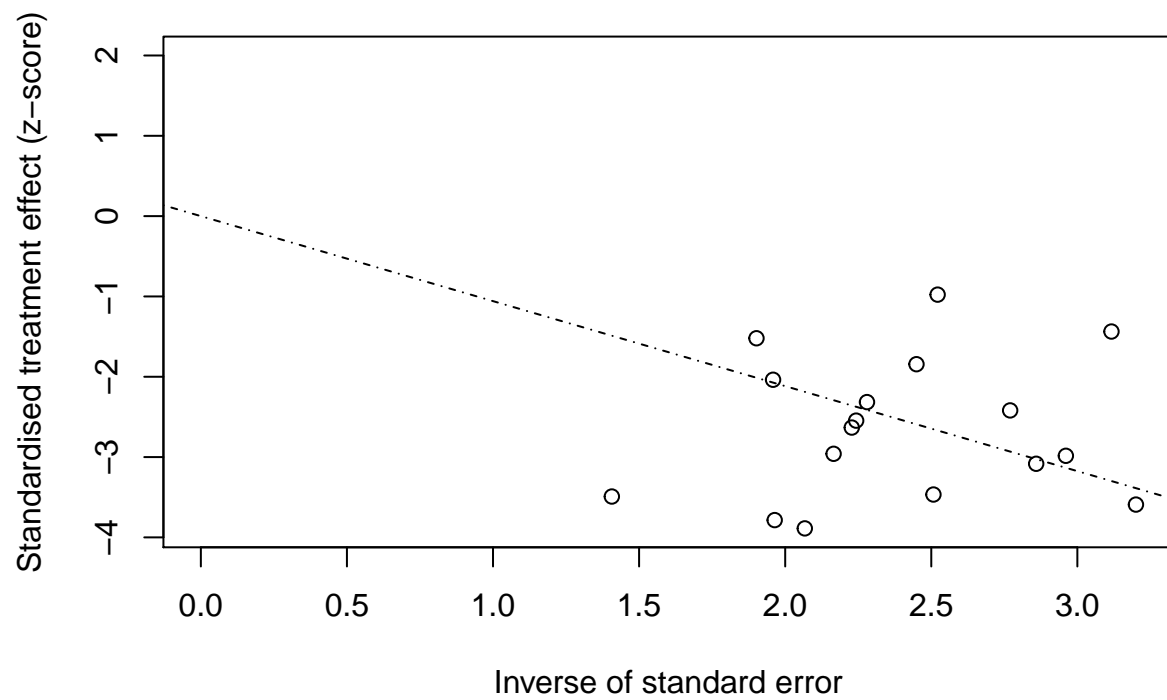
```
metabias(m1)
```

```
##
## Linear regression test of funnel plot asymmetry
##
## data: m1
## t = -2.8469, df = 15, p-value = 0.01224
## alternative hypothesis: asymmetry in funnel plot
## sample estimates:
##      bias      se.bias      slope
## -3.2230339  1.1321337  0.2416821
```

```
funnel(m1)
```



`radial(m1)`



## Metafor

```
#load primary libraries
library(tidyverse) #tidy functions to read and format data
library(metafor) #metafor package current version effective March 2020

#Classic bronchoconstriction data from Cochrane
data <- read_csv(url("https://ndownloader.figshare.com/files/14460386"))

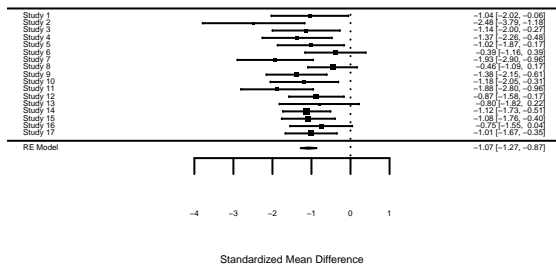
#calculate effect sizes
data <- escalc(measure = "SMD", m1i=Me,m2i=Mc,sd1i=Se,sd2i=Sc,n1i=Ne,n2i=Nc, data=data,var.names=c("SMD",

#fit model
#m2 <- rma(yi=SMD, vi=SMD_var, mods = ~study.ID, data = data)
m2 <- rma.uni(yi=SMD, vi=SMD_var, data = data, method = "REML") #restricted maximum-likelihood estimate
summary(m2)

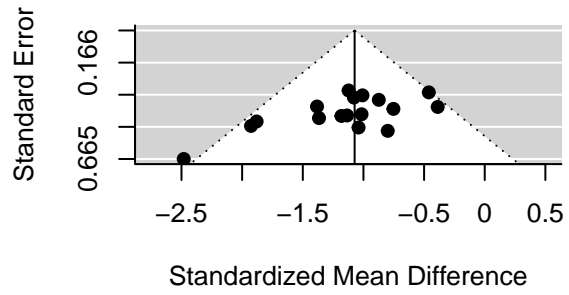
##
## Random-Effects Model (k = 17; tau^2 estimator: REML)
##
##   logLik  deviance      AIC      BIC     AICc
## -10.5948   21.1896   25.1896   26.7348   26.1127
##
## tau^2 (estimated amount of total heterogeneity): 0.0142 (SE = 0.0613)
## tau (square root of estimated tau^2 value):      0.1193
## I^2 (total heterogeneity / total variability):    7.88%
## H^2 (total variability / sampling variability):    1.09
##
## Test for Heterogeneity:
## Q(df = 16) = 19.4639, p-val = 0.2453
##
## Model Results:
##
## estimate      se      zval      pval      ci.lb      ci.ub
## -1.0727  0.1032  -10.3919  <.0001  -1.2750  -0.8703  ***
##
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

#Viz
plot(m2)
```

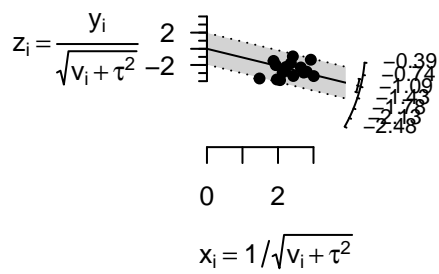
### Forest Plot



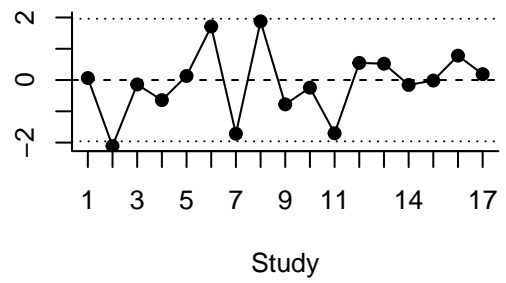
### Funnel Plot



### Radial Plot



### Standardized Residuals



## Compiled contrasts

```
#compile random model outputs for contrast with metafor
estimate <- as_data_frame(m1$TE.random)
se <- as_data_frame(m1$seTE.random)
zval <- as_data_frame(m1$zval.random)
pval <- as_data_frame(m1$pval.random)
ci.lb <- as_data_frame(m1$lower.random)
ci.ub <- as_data_frame(m1$upper.random)
m1_tidy <- bind_cols(estimate, se, zval, pval, ci.lb, ci.ub) %>%
  rename(estimate = value, se = value1, zval = value2, pval = value3, ci.lb = value4, ci.ub = value5)

#compile output into table for contrast with meta
m2_tidy <- coef(summary(m2))
#m2_tidy

#compile key outputs
contrast_tidy <- bind_rows(m1_tidy, m2_tidy) %>%
  mutate(source = c("meta", "metafor")) %>%
  select(source, everything())

knitr::kable(contrast_tidy)
```

source	estimate	se	zval	pval	ci.lb	ci.ub
meta	-1.069383	0.1081185	-9.890843	0	-1.281291	-0.8574745
metafor	-1.072657	0.1032201	-10.391944	0	-1.274965	-0.8703497