Package ‘SAMURAI’

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Type Package

Title Sensitivity Analysis of a Meta-analysis with Unpublished but Registered Analytical Investigations

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Description This package contains R functions to gauge the impact of unpublished studies upon the meta-analytic summary effect of a set of published studies. (Credits: The research leading to these results has received funding from the European Union’s Seventh Framework Programme (FP7/2007-2013) under grant agreement no. 282574.)

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Description

A fictional meta-analytic data set with 6 published studies and 2 unpublished studies. The binary outcome event is not desired.

Usage

data(BHHR2009p92)

Format

A data frame with 8 observations on the following 8 variables.

<table>
<thead>
<tr>
<th>variable</th>
<th>type</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>integer</td>
<td>Study numeric id (optional)</td>
</tr>
<tr>
<td>study</td>
<td>character</td>
<td>Name of study or principal investigator</td>
</tr>
<tr>
<td>year</td>
<td>integer</td>
<td>Year (optional)</td>
</tr>
<tr>
<td>outlook</td>
<td>factor</td>
<td>Denotes whether a study is unpublished, and if so, what outlook it has.</td>
</tr>
<tr>
<td>ctrl.n</td>
<td>integer</td>
<td>The sample size of the control arm.</td>
</tr>
<tr>
<td>expt.n</td>
<td>integer</td>
<td>The sample size of the experimental arm.</td>
</tr>
<tr>
<td>ctrl.events</td>
<td>integer</td>
<td>The number of (undesired) events within the control arm.</td>
</tr>
<tr>
<td>expt.events</td>
<td>integer</td>
<td>The number of (undesired) events within the experimental arm.</td>
</tr>
</tbody>
</table>

Details

The outlook of a study can be one of the following: published, very positive, positive, negative, very negative, current effect, no effect, very positive CL, positive CL, negative CL, or very negative CL.

Since the outcome event is undesired, when using the function forestsens(), specify the option higher.is.better=FALSE. Since this is the default setting for forestsens(), this does not need to be specified explicitly.

Source


Examples

library(SAMURAI)
data(BHHR2009p92)

forestsens(table=BHHR2009p92, binary=TRUE, higher.is.better=FALSE)

# To assign all unpublished studies to each of ten outlooks, one at a time,
# and then return a table of summary effects, their 95% confidence interval,
Description

A meta-analytic data set that includes 7 published placebo-controlled randomized studies of the effect of aspirin in preventing death after myocardial infarction. The data set also includes 2 (fictional) unpublished studies.

The defined binary outcome event is death, and is undesired. When using the function forestsens(), specify the option higher.is.better=FALSE.

Usage

data(Fleiss1993)

Format

A data frame with 9 observations on the following 8 variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>integer</td>
<td>Study numeric id (optional)</td>
</tr>
<tr>
<td>study</td>
<td>character</td>
<td>Name of study or principal investigator</td>
</tr>
<tr>
<td>year</td>
<td>integer</td>
<td>Year (optional)</td>
</tr>
<tr>
<td>outlook</td>
<td>factor</td>
<td>Denotes whether a study is unpublished, and if so, what outlook it has.</td>
</tr>
<tr>
<td>ctrl.n</td>
<td>integer</td>
<td>The sample size of the control arm.</td>
</tr>
<tr>
<td>expt.n</td>
<td>integer</td>
<td>The sample size of the experimental arm.</td>
</tr>
<tr>
<td>ctrl.events</td>
<td>integer</td>
<td>The number of (undesired) events within the control arm.</td>
</tr>
<tr>
<td>expt.events</td>
<td>integer</td>
<td>The number of (undesired) events within the experimental arm.</td>
</tr>
</tbody>
</table>

Details

The outlook of a study can be one of the following: published, very positive, positive, negative, very negative, current effect, no effect, very positive CL, positive CL, negative CL, or very negative CL.

Since the outcome event is undesired, when using the function forestsens(), specify the option higher.is.better=FALSE.

Source

References

Guido Schwartzer. meta package.

Examples

```r
library(SAMURAI)
data(Fleiss1993)

forestsens(table=Fleiss1993, binary=TRUE, higher.is.better=FALSE)
```

# To assign all unpublished studies to each of ten outlooks, one at a time,
# and then return a table of summary effects, their 95% confidence interval,
# and tau-squared.
summtab <- forestsens(table=Fleiss1993, binary=TRUE, higher.is.better=FALSE, all.outlooks=TRUE)
summtab
```

---

**forestsens**

**Forest Plot for Sensitivity Analysis**

Description

This function imputes missing effect sizes for unpublished studies and creates a forest plot. A set of forest plots can be generated for multiple imputations.

Usage

```r
forestsens(table, 
  binary = TRUE, mean.sd = FALSE, 
  higher.is.better = FALSE, 
  outlook = NA, all.outlooks = FALSE, 
  rr.vpos = NA, rr.pos = NA, rr.neg = NA, rr.vneg = NA, 
  smd.vpos = NA, smd.pos = NA, smd.neg = NA, smd.vneg = NA, 
  level = 95, 
  binary.measure = "RR", continuous.measure="SMD", 
  summary.measure="SMD", method = "DL", 
  random.number.seed = NA, sims = 10, smd.noise = 0.01, 
  plot.title = "", scale = 1, digits = 3)
```

Arguments

- **table**: The name of the table containing the meta-analysis data.
- **binary**: TRUE if the outcomes are binary events; FALSE if the outcome data is continuous.
- **mean.sd**: TRUE if the data set includes the mean and standard deviation of the both the control and experimental arms of studies with continuous outcomes; FALSE otherwise.
higher.is.better
TRUE if higher counts of binary events or higher continuous outcomes are desired; FALSE otherwise. For continuous outcomes, set as FALSE if a lower outcome (e.g. a more negative number) is desired.

outlook
If you want all unpublished studies to be assigned the same outcome, set this parameter to one of the following values: "very positive", "positive", "current effect", "negative", "very negative", "no effect", "very positive CL", "positive CL", "negative CL", "very negative CL".

all.outlooks
If TRUE, then a forest plot will be generated for each possible outlook.

rr.vpos
The user-defined relative risk for binary outcomes in unpublished studies with a "very positive" outlook.

rr.pos
The user-defined relative risk for binary outcomes in unpublished studies with a "positive" outlook.

rr.neg
The user-defined relative risk for binary outcomes in unpublished studies with a "negative" outlook.

rr.vneg
The user-defined relative risk for binary outcomes in unpublished studies with a "very negative" outlook.

smd.vpos
The user-defined standardized mean difference for continuous outcomes in unpublished studies with a "very positive" outlook.

smd.pos
The user-defined standardized mean difference for continuous outcomes in unpublished studies with a "positive" outlook.

smd.neg
The user-defined standardized mean difference for continuous outcomes in unpublished studies with a "negative" outlook.

smd.vneg
The user-defined standardized mean difference for continuous outcomes in unpublished studies with a "very negative" outlook.

level
The confidence level, as a percent.

binary.measure
The effect size measure used for binary outcomes. "RR" for relative risk; "OR" for odds ratios.

continuous.measure
The effect size measure used for continuous outcomes. "SMD" for standardized mean difference (with the assumption of equal variances).

summary.measure
The measure used for summary effect sizes.

method
The same parameter in the escalc() function of the metafor package. "DL" for the DerSimonian-Laird method.

random.number.seed
Leave as NA if results are to be randomized each time. Set this value to a integer between 0 and 255 if results are to be consistent (for purposes of testing and comparison).

sims
The number of simulations to run per study when imputing unpublished studies with binary outcomes.

smd.noise
The standard deviation of Gaussian random noise to be added to standardized mean differences when imputing unpublished studies with continuous outcomes.

plot.title
Main title of forest plot.
scale  Changes the scaling of fonts in the forest plot.

digits  The number of significant digits (decimal places) to appear in the table of summary results which appears if all.outlooks=TRUE.

Details

For unpublished studies with binary outcomes, random numbers are generated from binomial distributions to impute the number of events in the experimental arms of experimental studies. The parameter of these distributions depends out the outlook of the unpublished study and the rate of events in the control arms of published studies. By default, 10 simulations are run and their average is used to impute the number of events in the experimental arm.

For unpublished studies with continuous outcomes, a 'very good' approximator mentioned by Borenstein is used to impute the variance of the standardized mean difference. See Borenstein et al, 2009, pages 27-28.

Note

The function employs functions in the metafor package: escalc() and forest().

Author(s)

Noory Kim

References


See Also

Hpylori, greentea

Examples

library(SAMURAI)

data(Hpylori)

forestsens(Hpylori, binary=TRUE, higher.is.better=FALSE)
forestsens(Hpylori, binary=TRUE, higher.is.better=FALSE, plot.title="Test")
forestsens(Hpylori, binary=TRUE, higher.is.better=FALSE, random.number.seed=52)
forestsens(Hpylori, binary=TRUE, higher.is.better=FALSE, outlook="negative")
forestsens(Hpylori, binary=TRUE, higher.is.better=FALSE, all.outlooks=TRUE)
funnelplot

funnelplot

Description

This function (1) imputes data for a meta-analytic data set with unpublished studies, then (2) generates a funnel plot.

Usage

funnelplot(table,
    binary=TRUE, mean.sd=TRUE,
    higher.is.better=NA, outlook=NA,
    vpos=NA, pos=NA, neg=NA, vneg=NA,
    level=95,
    binary.measure="RR", continuous.measure="SMD",
    summary.measure="SMD", method="DL",
    random.number.seed=NA, sims=1, smd.noise=0.01,
    title="", pch.pub=19, pch.unpub=0)

Arguments

table  The name of the table containing the meta-analysis data.
binary TRUE if the outcomes are binary events; FALSE if the outcome data is continuous.
mean.sd TRUE if the data set includes the mean and standard deviation of the both the control and experimental arms of studies with continuous outcomes; FALSE otherwise.
higher.is.better TRUE if higher counts of binary events or higher continuous outcomes are desired; FALSE otherwise. For continuous outcomes, set as FALSE if a lower outcome (eg. a more negative number) is desired.
outlook If you want all unpublished studies to be assigned the same outcome, set this parameter to one of the following values: "very positive", "positive", "current effect", "negative", "very negative", "no effect", "very positive CL", "positive CL", "negative CL", "very negative CL".
vpos The user-defined effect size for unpublished studies with a "very positive" outlook.
funnelplot

pos        The user-defined effect size for unpublished studies with a "positive" outlook.
neg        The user-defined effect size for unpublished studies with a "negative" outlook.
vneg       The user-defined effect size for unpublished studies with a "very negative" outlook.
level      The confidence level, as a percent.
binary.measure The effect size measure used for binary outcomes. "RR" for relative risk; "OR" for odds ratios.
continuous.measure The effect size measure used for continuous outcomes. "SMD" for standardized mean difference (with the assumption of equal variances).
summary.measure The measure used for summary effect sizes.
random.number.seed Leave as NA if results are to be randomized each time. Set this value to an integer between 0 and 255 if results are to be consistent (for purposes of testing and comparison).
sims       The number of simulations to run per study when imputing unpublished studies with binary outcomes.
smd.noise  The standard deviation of Gaussian random noise to be added to standardized mean differences when imputing unpublished studies with continuous outcomes.
title      The title of the funnel plot.
pch.pub    The symbol used to denote a published study.
pch.unpub  The symbol used to denote an unpublished study.

Note

The function employs functions in the metafor package: escalc() and forest().

Author(s)

Noory Kim

See Also

forestsens

Examples

library(SAMURAI)
data(Hpylori)
funnelplot(Hpylori, binary=TRUE, higher.is.better=FALSE, outlook="very negative")
data(greentea)
funnelplot(greentea, binary=FALSE, higher.is.better=FALSE)
The effect of green tea on weight loss.

Description

Randomized clinical trials of at least 12 weeks duration assessing the effect of green tea consumption on weight loss.

Usage

data(greentea)

Format

A data frame with 14 observations on the following 9 variables.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>study</td>
<td>character</td>
<td>Name of study or principal investigator</td>
</tr>
<tr>
<td>year</td>
<td>numeric (integer)</td>
<td>Year (optional)</td>
</tr>
<tr>
<td>outlook</td>
<td>factor</td>
<td>Denotes whether a study is unpublished, and if so, what outlook it has.</td>
</tr>
<tr>
<td>ctrl.n</td>
<td>numeric (integer)</td>
<td>The sample size of the control arm.</td>
</tr>
<tr>
<td>expt.n</td>
<td>numeric (integer)</td>
<td>The sample size of the experimental arm.</td>
</tr>
<tr>
<td>ctrl.mean</td>
<td>numeric</td>
<td>The mean effect within the control arm.</td>
</tr>
<tr>
<td>expt.mean</td>
<td>numeric</td>
<td>The mean effect within the experimental arm.</td>
</tr>
<tr>
<td>ctrl.sd</td>
<td>numeric</td>
<td>The standard deviation of the outcome within the control arm.</td>
</tr>
<tr>
<td>expt.sd</td>
<td>numeric</td>
<td>The standard deviation of the outcome within the experimental arm.</td>
</tr>
</tbody>
</table>

Details

The outlook of a study can be one of the following: published, very positive, positive, negative, very negative, current effect, no effect, very positive CL, positive CL, negative CL, or very negative CL.

In this setting, a more negative change in outcome is desired; specify the option higher.is.better=FALSE for the function forestsens().

Source


Figure 6. Forest plot of comparison: 1 Primary outcomes, outcome: 1.2Weight loss studies conducted in/outside Japan.

Examples

data(greentea)
greentea
Healing of duodenal ulcers by *Helicobacter pylori* eradication therapy

**Description**

Randomized clinical trials comparing duodenal ulcer acute healing among (1) patients on ulcer healing drug + *Helicobacter pylori* eradication therapy vs. (2) patients ulcer healing drug alone. The event counts represent the numbers of patients not healed.

**Usage**

data(Hpylori)

**Format**

A data frame with 33 observations on the following 7 variables.

- **study** character: Name of study or principal investigator
- **year** numeric: Year (optional)
- **outlook** factor: Denotes whether a study is unpublished, and if so, what outlook it has.
- **ctrl.n** numeric: The sample size of the control arm.
- **expt.n** numeric: The sample size of the experimental arm.
- **ctrl.events** numeric: The number of (undesired) events within the control arm.
- **expt.events** numeric: The number of (undesired) events within the experimental arm.
Details

The outlook of a study can be one of the following: published, very positive, positive, negative, very negative, current effect, no effect, very positive CL, positive CL, negative CL, or very negative CL.

Since the outcome event is undesired, when using the function `forestsens()`, specify the option `higher.is.better=FALSE`.

Source


Figure 3. Forest plot of comparison: 1 duodenal ulcer acute healing hp eradication + ulcer healing drug vs. ulcer healing drug alone, outcome: 1.1 Proportion not healed.

Examples

data(Hpylori)
Hpylori

forestsens(table=Hpylori, binary=TRUE, higher.is.better=FALSE, scale=0.8)

# To fix the random number seed to make the results reproducible.
forestsens(table=Hpylori, binary=TRUE, higher.is.better=FALSE, scale=0.8, random.number.seed=106)

# To modify the outlooks of all unpublished studies to, say, "very negative".
forestsens(table=Hpylori, binary=TRUE, higher.is.better=FALSE, scale=0.8, random.number.seed=106, outlook="very negative")

# To modify the outlooks of all unpublished studies to, say, "very negative", # and overruling the default relative risk assigned to "very negative".
forestsens(table=Hpylori, binary=TRUE, higher.is.better=FALSE, scale=0.8, random.number.seed=106, outlook="very negative", rr.vneg=2.5)

# To generate a forest plot for each of the ten default outlooks
# defined by forestsens().
forestsens(table=Hpylori, binary=TRUE, higher.is.better=FALSE, scale=0.8, random.number.seed=106, all.outlooks=TRUE)
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