

# Package ‘BMA’

October 1, 2025

**Type** Package

**Title** Bartlett-type corrections for improved confidence intervals in random-effects meta-analysis

**Version** 1.1.1

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**Description** In medical meta-analysis, the DerSimonian–Laird and restricted maximum likelihood (REML) confidence intervals for the average treatment effect have been widely used in practice. However, it is well recognized that their coverage probabilities, that is, the probabilities that the intervals contain the true value, can fall substantially below the nominal level. One important reason is that the validity of these confidence intervals relies on the assumption that the number of studies included in the synthesis is sufficiently large. In most medical meta-analyses, however, the number of studies is fewer than 20. Noma (2011) <[doi:10.1002/sim.4350](https://doi.org/10.1002/sim.4350)> developed three alternative confidence intervals to improve coverage performance, based on (i) the Bartlett-corrected likelihood ratio statistic, (ii) the efficient score statistic, and (iii) the Bartlett-type adjusted efficient score statistic. The Bartlett and Bartlett-type corrections enhance the large-sample approximations for the likelihood ratio and efficient score statistics, and markedly improve coverage performance.

**License** GPL-3

**Encoding** UTF-8

**Roxygen** list(markdown = TRUE)

**RoxygenNote** 7.3.1

**Depends** R (>= 4.0)

**Imports** stats

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| BMA | <i>Bartlett-type corrections for improved confidence intervals in random-effects meta-analysis</i> |
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### Description

Calculating improved confidence intervals for random-effects meta-analysis by (1) the likelihood ratio statistic, (2) the Bartlett-corrected likelihood ratio statistic, (3) the efficient score statistic, and (4) the Bartlett-type adjusted efficient score statistic.

### Usage

```
BMA(y, V, data=NULL, alpha=0.95, eform=FALSE)
```

### Arguments

|       |  |
|-------|--|
| y     | The outcome variable (e.g., log-odds-ratio, mean difference).  |
| V     | The variances of y.  |
| data  | A data frame, list or environment (or object coercible by <code>as.data.frame</code> to a data frame) containing the variables in the model. |
| alpha | Confidence level for calculating confidence intervals (default: 0.95).   |
| eform | A logical value that specify whether the outcome should be transformed by exponential function (default: FALSE).                             |

### Value

The resultant improved confidence intervals are provided.

### References

Noma, H. (2011). Confidence intervals for a random-effects meta-analysis based on Bartlett-type corrections. *Statistics in Medicine* **30**: 3304-3312. doi:[10.1002/sim.4350](https://doi.org/10.1002/sim.4350)

### Examples

```
pkgCheck <- function(pkg){
  if (!requireNamespace(pkg, quietly = TRUE)) install.packages(pkg)
  library(pkg, character.only = TRUE)
}

pkgCheck("metafor") # load and/or install "metafor" package

data(magnesium)

edit_Mg <- escalc(measure="OR", ai=d1, n1i=n1, ci=d0, n2i=n0, data=magnesium)
# Calculating the summary statistics of individual studies

BMA(yi, vi, data=edit_Mg, eform=TRUE)
# The Bartlett-type corrections for random-effects meta-analysis
```

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magnesium*Meta-analysis for intravenous magnesium in suspected acute myocardial infarction*

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**Description**

This dataset originates from a meta-analysis that synthesized randomized controlled trials evaluating intravenous magnesium for suspected acute myocardial infarction. It provides study-level data from several relatively small trials, allowing users to replicate the analysis of mortality outcomes. The dataset is commonly used to illustrate methods of meta-analysis and the evaluation of treatment effects across multiple trials.

- id: Study ID
- study: First author name and year(s) of publication
- d1: Number of death in magnesium group
- n1: Sample size in magnesium group
- d0: Number of death in placebo group
- n0: Sample size in placebo group

**Usage**

```
data(magnesium)
```

**Format**

A data frame with 7 rows and 6 variables

**References**

Teo, K. K., Yusuf, S., Collins, R., Held, P. H., and Peto, R. (1991). Effects of intravenous magnesium in suspected acute myocardial infarction: overview of randomized trials. *BMJ*. **303**: 1499-1503.

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