Replication report - Petersen et al 2006

Anna Lohmann1,✉, and Rolf Groenwold2

04 August, 2020

Text of abstract

1 Department of Clinical Epidemiology Leiden University Medical Center  
2 Uof0

✉ Correspondence: [Anna Lohmann <[a.l.lohmann@lumc.nl](mailto:a.l.lohmann@lumc.nl)>](mailto:a.l.lohmann@lumc.nl)

# Introduction

This replication report documents the replication attempt of Peters, J. L. (2006). Comparison of Two Methods to Detect Publication Bias in Meta-analysis. JAMA, 295(6), 676. <https://doi.org/10.1001/jama.295.6.676>

Section 2 will detail the sources of information utilized for the present replication attempt. Section 3 will provide an overview of the information that was extracted from those sources. Section 4 covers all Researcher degrees of freedom i.e. decisions that had to be made by the replicators because of insufficient or contradicting information in the original sources. Section 5 presents descriptive statistics from the data generating mechanism, i.e. the artificial sample. Section 6 presents the replicated results.

# Information basis

The information upon which the replication was based stems from two different sources (1) the published manuscript as well as (2) a technical report. The published manuscript mentioned that details of the simulation were available in a technical report. This technical report is listed in the reference section of the published article, however it was not obtainable from the public domain (i.e. online line supplements or a public online repository). The technical report [Peters, J. L., Sutton, A. J., Jones, D. R., Abrams, K. R., & Rushton, L. (2005). Performance of tests and adjustments for publication bias in the presence of heterogeneity (Technical Report No. 05–01; pp. 1–57). Department of Health Sciences, University of Leicester.] was hence obtained by email from the Department of Health Sciences at Leister University ([hsenquiries@leicester.ac.uk](mailto:hsenquiries@leicester.ac.uk)). Conflicting or insufficient information from there two sources were supplemented with information from referenced articles in either manuscript as well as similar publications on the topic by the same authors.

# Extracted Information

The following information pertaining to the implementation of the simulation study was extracted from the above mentioned sources:

## Data generating mechanism

### fixed effects model is given by

where is the true underlying effect lnOR

### random effects model

with where is the true effect in study i true underlying effect lnOR is the between-study variance

Between-study variance is defined to be 20%, 150, and 500% of the average within-study variance for studies from the corresponding simulations this compares with specifications of , describing the percentage of total variation across studies that is due to between-study heterogeneity rather than chance (ref 25). Here 20%, 150% and 500 % of the within-study variation corresponds to an of 16.7%, 60% and 83% respectively.

#### Number of primary studies 6,16,30 or 90

## DGM for single study

## Method

## Data generating mechanism

1000 repetitions per scenario

### Simulation factors

The following table shows an overview of simulation factors.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Simulation factor | Levels | Implementation details | Source |  |
| Varied |  |  |  |  |
| Publication bias | none, effect size based moderate (14%), effect size based severe (40%), p-value based moderate, p-value based severe (see table below) |  |  |  |
| True effect size (OR) | 1, 1.2, 1.5, 3, 5 |  |  |  |
| Between Study Heterogeneity () | 0, 20, 150, 500 (0, 16.7%, 60%, 83.3%) | percentage of the average within-study variance estimate |  |  |
| Number of primary studies in meta-analysis | 6, 16, 30, 90 | this number corresponds to the number of studies after publication bias |  |  |
| Sample size control group | exponential of the normal distribution with a mean of 5 and variance of 0.3 |  |  |  |
| Fixed |  |  |  |  |
| Ratio treatment:control group | 1:1 |  |  |  |
| Probability of event in control group | sampled from unif(0.3, 0.7) |  |  |  |

#### Publication bias

1. studies are censored as a result of the one-sided p-value associated with the effect estimate of interest
2. studies with the most extreme effect estimates of effect are censored

## Compared Methods

### Model 1 ( Egger’s fixed effects regression on the standard error)

Egger’s regression test is given by

which is equivalent to weighted by

where is the lnOR from study i and is the standard error of

### Model 2 (Eggert’s fixed regression on the inverse of sample size)

## Performance measures

Type 1 error rate (proportion of false positives) Power to detect publication bias when it is present (proportion of true positive results)

# Researcher degrees of Freedom

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Not specified | Replicator decision | Justification |  |  |
| Dealing with empty cells | add 0.5 to every empty cell | common solution |  |  |
| Which set to compute average within-study-variance on | largest number of studies generated before application of publication bias | Most accurate correspondance to intended I^2 |  |  |
| Data dependence | each scenario is implemented in independently generated data | Recomendatios of Burton et al. |  |  |
| Is probability of event in control-group fixed for all studies in one meta-analysis? | Probability of event in CG assumed as fixed | Wording was not unambigous but both authors tended towards that interpretation |  |  |
|  |  |  |  |  |

## Publication bias based on effect size

two levels moderate vs severe > either 14% or 40 % of the most extreme studies showing a negative effect of the exposure (i.e. OR <1) were censored such that the final number of studies in a meta -analysis was still 6, 16, 30, or 90 i.e. for the 6 studies 10 haven been generated and 4 studies with the most extreme negative estimates have been censored

This statement contradicts itself. On the one hand it suggests, that extreme studies with a negative effect of the exposure should be censored. On the other hand it suggests to censor either 14% or 40% of studies. Especially with large effect sized (e.g. an OR of 5) it is highly unlikely to have 40% of studies with a negative effect of the exposure.

# Simulation Descriptives

# Results

# Discussion

# Acknowledgments

# References

### Reproducibility Information

This report was generated on 2020-08-04 19:32:12 using the following computational environment and dependencies:

#> ─ Session info ───────────────────────────────────────────────────────────────  
#> setting value   
#> version R version 3.6.2 (2019-12-12)  
#> os Ubuntu 18.04.3 LTS   
#> system x86\_64, linux-gnu   
#> ui X11   
#> language (EN)   
#> collate en\_US.UTF-8   
#> ctype en\_US.UTF-8   
#> tz Europe/Berlin   
#> date 2020-08-04   
#>   
#> ─ Packages ───────────────────────────────────────────────────────────────────  
#> package \* version date lib source   
#> assertthat 0.2.1 2019-03-21 [1] CRAN (R 3.6.2)  
#> backports 1.1.7 2020-05-13 [1] CRAN (R 3.6.2)  
#> bookdown 0.19 2020-05-15 [1] CRAN (R 3.6.2)  
#> callr 3.4.3 2020-03-28 [1] CRAN (R 3.6.2)  
#> cli 2.0.2 2020-02-28 [1] CRAN (R 3.6.2)  
#> crayon 1.3.4 2017-09-16 [1] CRAN (R 3.6.2)  
#> desc 1.2.0 2018-05-01 [1] CRAN (R 3.6.2)  
#> devtools 2.3.0 2020-04-10 [1] CRAN (R 3.6.2)  
#> digest 0.6.25 2020-02-23 [1] CRAN (R 3.6.2)  
#> ellipsis 0.3.1 2020-05-15 [1] CRAN (R 3.6.2)  
#> evaluate 0.14 2019-05-28 [1] CRAN (R 3.6.2)  
#> fansi 0.4.1 2020-01-08 [1] CRAN (R 3.6.2)  
#> fs 1.4.1 2020-04-04 [1] CRAN (R 3.6.2)  
#> glue 1.4.1 2020-05-13 [1] CRAN (R 3.6.2)  
#> htmltools 0.4.0 2019-10-04 [1] CRAN (R 3.6.2)  
#> knitr 1.28 2020-02-06 [1] CRAN (R 3.6.2)  
#> magrittr 1.5 2014-11-22 [1] CRAN (R 3.6.2)  
#> memoise 1.1.0 2017-04-21 [1] CRAN (R 3.6.2)  
#> pkgbuild 1.0.8 2020-05-07 [1] CRAN (R 3.6.2)  
#> pkgload 1.0.2 2018-10-29 [1] CRAN (R 3.6.2)  
#> prettyunits 1.1.1 2020-01-24 [1] CRAN (R 3.6.2)  
#> processx 3.4.2 2020-02-09 [1] CRAN (R 3.6.2)  
#> ps 1.3.3 2020-05-08 [1] CRAN (R 3.6.2)  
#> R6 2.4.1 2019-11-12 [1] CRAN (R 3.6.2)  
#> Rcpp 1.0.4.6 2020-04-09 [1] CRAN (R 3.6.2)  
#> remotes 2.1.1 2020-02-15 [1] CRAN (R 3.6.2)  
#> rlang 0.4.6 2020-05-02 [1] CRAN (R 3.6.2)  
#> rmarkdown 2.1 2020-01-20 [1] CRAN (R 3.6.2)  
#> rprojroot 1.3-2 2018-01-03 [1] CRAN (R 3.6.2)  
#> sessioninfo 1.1.1 2018-11-05 [1] CRAN (R 3.6.2)  
#> stringi 1.4.6 2020-02-17 [1] CRAN (R 3.6.2)  
#> stringr 1.4.0 2019-02-10 [1] CRAN (R 3.6.2)  
#> testthat 2.3.2 2020-03-02 [1] CRAN (R 3.6.2)  
#> usethis 1.6.1 2020-04-29 [1] CRAN (R 3.6.2)  
#> withr 2.2.0 2020-04-20 [1] CRAN (R 3.6.2)  
#> xfun 0.13 2020-04-13 [1] CRAN (R 3.6.2)  
#> yaml 2.2.1 2020-02-01 [1] CRAN (R 3.6.2)  
#>   
#> [1] /home/anna/R/x86\_64-pc-linux-gnu-library/3.6  
#> [2] /usr/local/lib/R/site-library  
#> [3] /usr/lib/R/site-library  
#> [4] /usr/lib/R/library

The current Git commit details are:

#> Local: master /home/anna/Dropbox/anna/projects/replisims/peters2006  
#> Remote: master @ origin (https://github.com/replisims/peters-2016.git)  
#> Head: [7af113c] 2020-08-02: Update replication report