

FAIL-SAFE NUMBER CALCULATOR

Michael S. Rosenberg

Copyright © 2005-2008

This program calculates fail-safe numbers for meta-analysis based on the methods described in:

Rosenberg, M. S. 2005. The file-drawer problem revisited: A general weighted method for calculating fail-safe numbers in meta-analysis. *Evolution* 59(2):464-468.

The program is designed to run under 32-bit Windows operating systems, although it also should run under common emulators. It takes a list of precalculated effect sizes and variances, determines the grand mean, its variance, and significance, and determines fail-safe numbers based on Rosenthal's method (Rosenthal 1979) and the new methods described in the above article. For general details on meta-analysis methods see Hedges and Olkin (1985) or Rosenberg *et al.* (2000; 2004). If you use this program, please cite Rosenberg (2005).

To use the program:

1. Press the "Load" button to bring data into the program. Data files consist of simple text files with the following format.
 - a. The first line of the file consists of column headers.
 - b. The remainder of the file lists the effect sizes and variances for each individual study. Each line should have a predetermined effect size (*e.g.*, Hedges' *d*, Z-transformed correlation coefficient, or *ln* odds ratio) for a single study, followed by the variance estimate for that study. The effect sizes and variances should be separated by spaces or tabs.

Effect Size	Variance
1.47221949	0.016129032
-0.309519604	0.013333333
0.070114671	0.012345679
0.887183863	0.016666667
0.549306144	0.016666667
-0.309519604	0.019607843
0.677666068	0.009090909

Figure 1. Example of an input data file.

2. Choose whether you wish to perform random-effects model meta-analysis calculations. The fixed-effects methods are included as a subset of the random-effects model.
3. Press the "Analyze" button. The results (described below) will be listed in the text box.

Description of Results

1. The output starts with the name of the input file and the number of studies found within the file.
2. This is followed by the results for the Fixed-Effects Model.
 - a. The grand mean and variance are listed for the input data.
 - b. Significance tests of whether the grand mean differs from zero. This includes the t -score, the probability based on an assumption of the Normal distribution, and the probability based on Student's t -distribution.
 - c. The fail-safe numbers. The desired significance level is listed in parentheses (currently fixed at 0.05). The output includes:
 - i. Rosenthal's fail-safe number
 - ii. Rosenberg's fail-safe number, based on the normal distribution
 - iii. Rosenberg's fail-safe number, based on the t -distribution and assuming the addition of 1 additional study (N1)
 - iv. Rosenberg's fail-safe number, based on the t -distribution and assuming the addition of multiple studies (N+)
 - d. For the curious, the number of iterations needed to reach convergence are included after N1 and N+; they will normally small (<10).
3. If requested, the results for the Random-Effects Model will follow. These results include the same information included for the Fixed-Effects Model, except Rosenthal's and Rosenberg's Normal fail-safe numbers are excluded.
 - a. If a random-effects model cannot be used because of a zero or negative estimate of the pooled variance, a note saying the result collapses to a fixed-effects model will be listed. This can happen either for the entire model, for both fail-safe numbers, or for an individual fail-safe number.

Technical Problems

For technical problems, contact me at msr@asu.edu. If possible, include a copy of the problematic data file.

References

- Hedges, L. V., and I. Olkin. 1985. *Statistical Methods for Meta-Analysis*. San Diego, CA: Academic Press, Inc.
- Rosenberg, M. S. 2005. The file-drawer problem revisited: A general weighted method for calculating fail-safe numbers in meta-analysis. *Evolution* 59:464-468.
- Rosenberg, M. S., D. C. Adams, and J. Gurevitch. 2000. *MetaWin: Statistical Software for Meta-Analysis* (Sunderland, Massachusetts: Sinauer Associates).
- Rosenberg, M. S., K. A. Garrett, Z. Su, and R. L. Bowden. 2004. Meta-analysis in plant pathology: Synthesizing research results. *Phytopathology* 94:1013-1017.
- Rosenthal, R. 1979. The "file drawer problem" and tolerance for null results. *Psychological Bulletin* 86:638-641.

Release History

Version 1.0.2.11 (February 5, 2008)

- Fixed a small bug which occasionally created an error in foreign language versions of Windows
- Added an error reporting system that can email debug information

Version 1.0.1.1 (March 1, 2005)

- Initial release