Introduction

Methods and issues around heterogeneity

(Remarks on the introduction of I^2, and related events)

Julian Higgins

University of BRISTOL

The University of Reading, 1993-

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Department of Applied Statistics

Exploiting Information in Random Effects Meta-analysis

JULIAN P.T. HIGGINS

Submitted for the degree of PhD

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- Study i estimates parameter θ_i
- **Heterogeneity**:

  $\theta_i \neq \theta_j$ for at least one pair

- A test for heterogeneity has poor properties and asks an uninteresting question

Imperial College London and MRC Cambridge, 1998-

- Post doc on Medical Research Council grant (Simon Thompson, Doug Altman, Jon Deeks)
- Included an aim to find a better way to measure heterogeneity

- *Solved?*

$$I^2 = \frac{Q-(k-1)}{Q} \times 100\% \qquad\qquad I^2 = \frac{\hat{\tau}^2}{\hat{\tau}^2+\hat{\sigma}^2}$$

(k = number of studies)

- I originally stood for "intraclass"
- (I now say it stands for "inconsistency")

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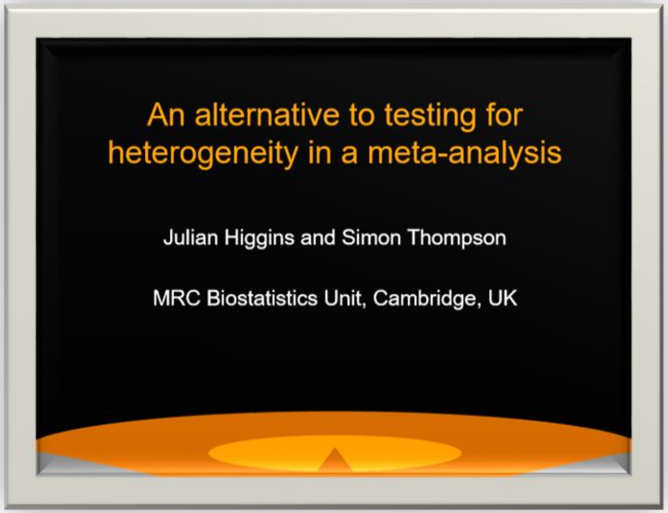
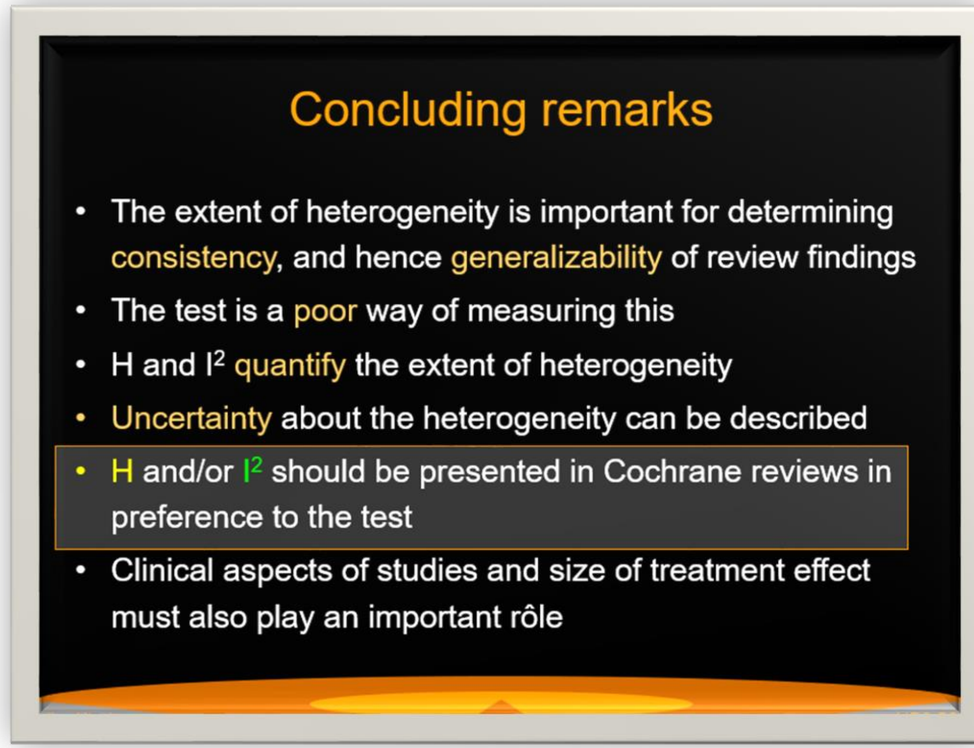
Cochrane Colloquium, Lyon 2001





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I^2 *was* presented (...and misunderstood)

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Julian P. T. Higgins, Simon G. Thompson

MRC Biostatistics Unit, Institute of Public Health, Robinson Way, Cambridge CB2 2SR, U.K.

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The extent of heterogeneity in a meta-analysis partly determines the difficulty in drawing overall conclusio… extent may be measured by estimating a between-study variance, but interpretation is then specific to a p… treatment effect metric. A test for the existence of heterogeneity e… View Full Abstract

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…2 is not an …erogeneity

…arry V. Hedges[c] and

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rates

10.9 Meta-analysis of time-to-event outcomes

10.10 Heterogeneity

10.10.1 What is heterogeneity?

10.10.2 Identifying and measuring heterogeneity

10.10.3 Strategies for

Thresholds for the interpretation of the I^2 statistic can be misleading, since the importance of inconsistency depends on several factors. A rough guide to interpretation in the context of meta-analyses of randomized trials is as follows:

- 0% to 40%: might not be important;
- 30% to 60%: may represent moderate heterogeneity*;
- 50% to 90%: may represent substantial heterogeneity*;
- 75% to 100%: considerable heterogeneity*.

*The importance of the observed value of I^2 depends on (1) magnitude and direction of effects, and (2) strength of evidence for heterogeneity (e.g. P value from the Chi^2 test, or a confidence interval for I^2: uncertainty in the value of I^2 is substantial when the number of studies is small).

Frank E. Harrell, Kerry L. Lee, Daniel B. Mark

Duke University

Univ. Reading and MRC Cambridge, 1993-97

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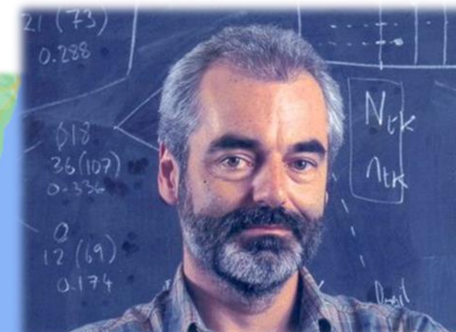

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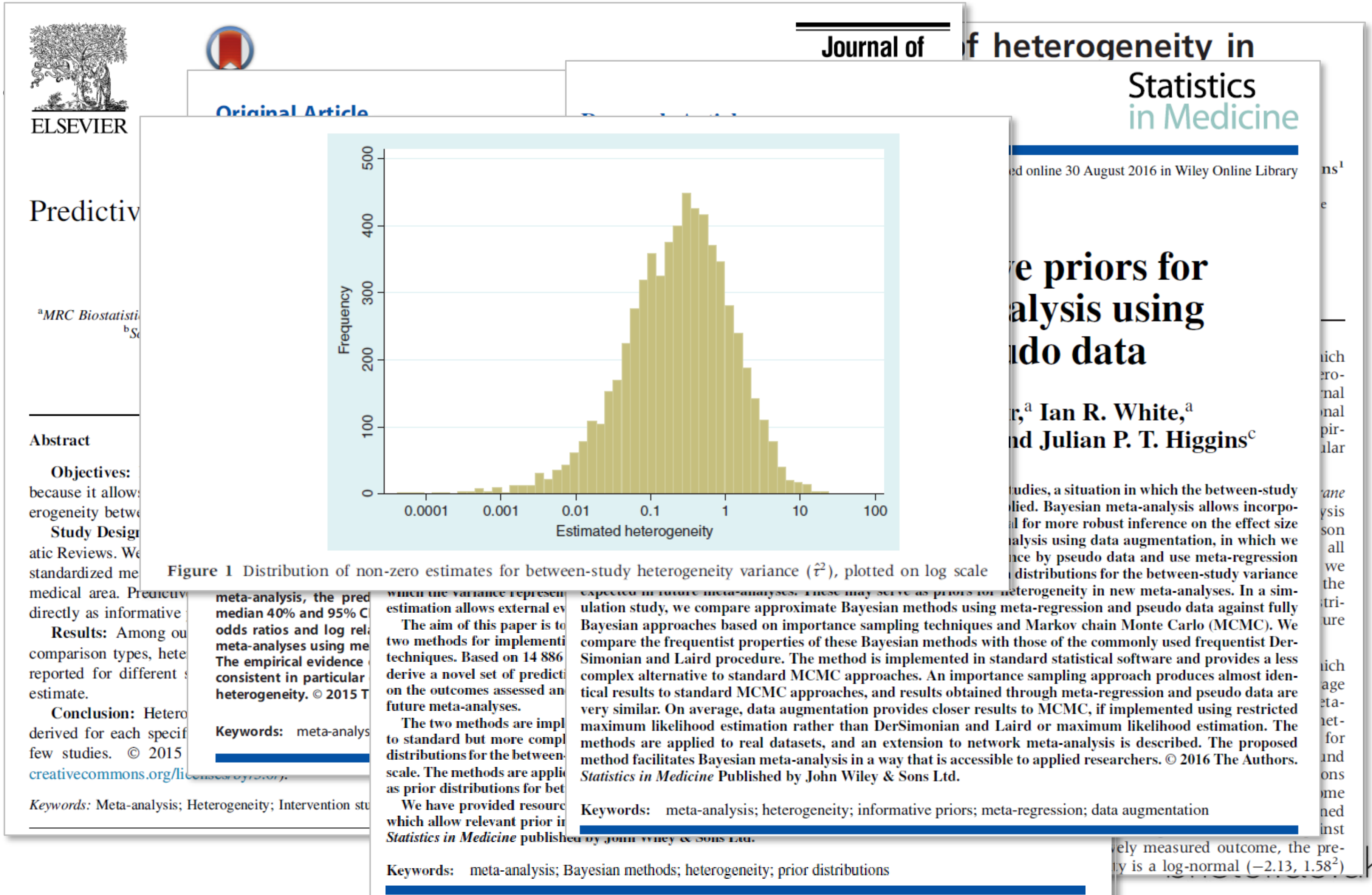
MRC Cambridge, 2006-



- I owe particular debts to
  - the MRC
  - Simon Thompson
  - Doug Altman and Jon Deeks
  - David Spiegelhalter
  - Anne Whitehead
  - Ian White
  - Cochrane